

316 DATA ON  
RESEARCH  
UTILIZATION  
1967-68



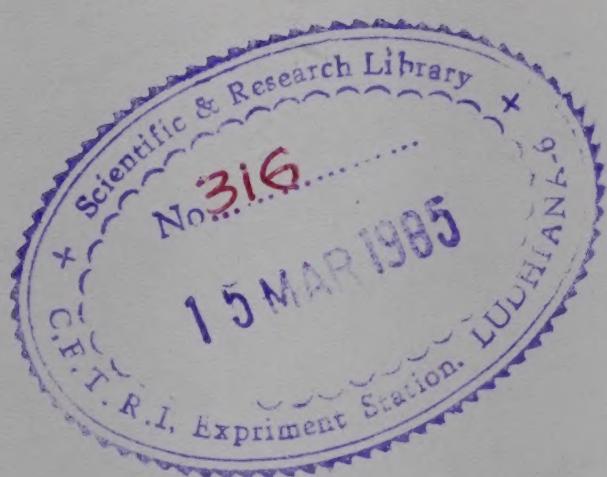
Council of Scientific & Industrial Research New Delhi



# DATA ON RESEARCH UTILIZATION 1967 - 68



Division of Research Co-ordination & Industrial Liaison  
COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH  
NEW DELHI



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## ABBREVIATIONS USED

BITM	Birla Industrial & Technological Museum, Calcutta
CBRI	Central Building Research Institute, Roorkee
CDRI	Central Drug Research Institute, Lucknow
CECRI	Central Electro-Chemical Research Institute, Karaikudi
CEERI	Central Electronics Engineering Research Institute, Pilani
CFRI	Central Fuel Research Institute, Jealgora
CFTRI	Central Food Technological Research Institute, Mysore
CGCRI	Central Glass and Ceramic Research Institute, Calcutta
CIMPO	Central Indian Medicinal Plants Organisation, Lucknow
CLRI	Central Leather Research Institute, Madras
CMERI	Central Mechanical Engineering Research Institute, Durgapur
CMRS	Central Mining Research Station, Dhanbad
CPHERI	Central Public Health Engineering Research Institute, Nagpur
CRRI	Central Road Research Institute, New Delhi
CSIO	Central Scientific Instruments Organisation, Chandigarh
CSMCRI	Central Salt & Marine Chemicals Research Institute, Bhavnagar
IIEM	Indian Institute of Experimental Medicine, Calcutta
IIP	Indian Institute of Petroleum, Dehra Dun
NAL	National Aeronautical Laboratory, Bangalore
NBG	National Botanic Gardens, Lucknow
NCL	National Chemical Laboratory, Poona
NGRI	National Geophysical Research Institute, Hyderabad
NML	National Metallurgical Laboratory, Jamshedpur
NPL	National Physical Laboratory, New Delhi
PEC	Process Evaluation Cell, New Delhi
RRL, Bhubaneshwar	Regional Research Laboratory, Bhubaneshwar
RRL, Hyderabad	Regional Research Laboratory, Hyderabad
RRL, Jammu	Regional Research Laboratory, Jammu
RRL, Jorhat	Regional Research Laboratory, Jorhat
SERC	Structural Engineering Research Centre, Roorkee
n.a.	Not available



## INTRODUCTION

During the span of twenty-five years, the Council of Scientific & Industrial Research and its research institutions have developed enough facilities and acquired adequate experience to tackle successfully, many of the scientific and technological problems that encounter the industrial development programmes of the country. This is reflected to a great extent, by the multiple mode of assistance which the National Laboratories, have been providing to the user government agencies and the private and public sectors of industries. Such assistance has been helpful in many ways particularly in (i) locating unknown resources of valuable raw materials through prospecting and surveys, (ii) exploitation of indigenous raw material through application of improved beneficiation and processing techniques, (iii) adaptation of known knowledge to local conditions for increasing production of imported or strategic material, (iv) creation of new knowledge and techniques leading to new processes and products, and (v) providing design and engineering assistance to stimulate the local production of engineering goods and machinery.

The research laboratories of the Council, thirty in number, have built up a high research potential in the fields of chemical, mechanical, civil and public health engineering, aeronautics, electronics, metallurgy, geophysics, coal and petroleum technology, glass and ceramics technology and food and leather technology. These facilities have been instrumental in providing the needed scientific assistance and advice to various organisations. Improved processes for manufacture of new products and assistance in the form of consultancy and advisory service were given to many of the public and private sector industries. The work on coal washing and upgrading and ore beneficiation has assisted the Iron and Steel Industry. The problems of Defence needs are being tackled by developing techniques for manufacture of strategic material and their production on semi-commercial scale. The Indian Standards Institution is being assisted in formulation of standards and specifications. The public utility departments for buildings, roads and health are offered advice in solution of their problems and implementation of their development programmes.

### Utilisation of CSIR Processes

The efforts of the Council in establishing close link of communication with the user organisations and industries, has been helpful in securing utilisation of many processes evolved at the research laboratories. Two hundred and eighty-seven (287) processes have been released for commercial exploitation, till the end of 1967-68 on royalty/premium basis or as technical assistance against payment. Out of these, one hundred and forty-four (144) processes are reported in production and one hundred and forty-three (143) are in various

stages of commercial development. Twentythree (23) processes provided as technical assistance free of charge are reported to have been adopted on commercial scale. During 1967-68, thirty-three (33) processes were in semi-commercial or pilot production on the prototype plants of the laboratories.

The trend of utilisation of CSIR Processes during the last nine years has been as under:

<i>Year</i>	<i>No. of leased processes in production</i>	<i>No. of processes in departmental production</i>	<i>Value of production (Rs. in lakhs)</i>
1959-60	17	7	24.2
1960-61	20	7	25.9
1961-62	26	13	81.8
1962-63	38	16	143.7
1963-64	46	28	202.2
1964-65	54	32	282.1
1965-66	77	41	311.0
1966-67	103	58	453.0
1967-68	144	33*	498.8**

\*Actual production jobs not incidental to experiments.

\*\*Partial figures.

### Design, Engineering and Consultancy Service

Adequate facilities by way of expertise, pilot plants and equipment have been built up at the laboratories for providing design, engineering and consultancy service to industry. Some of the laboratories have equipped themselves to offer know-how of processes with usual guarantees either by themselves or through consulting engineering firms. In addition to providing technical-service for its own processes, the CSIR Laboratories have also been offering consultancy assistance to the Industry. These include (a) general technical consultancy, primarily for solution of working problems of operation or raw materials, (b) undertaking survey, feasibility and project studies, (c) designing, fabrication or repairs of equipment and machinery, (d) assistance in planning and execution of projects, and (e) designing and testing of bridges and structures, etc.

The data regarding consultancy services offered by CSIR Laboratories during the last four years are given below:

	<i>No. of consultancy services</i>	<i>Fee for service (including project/ feasibility reports provided) (Rs. in lakhs)</i>
1964-65	19	2.40
1965-66	65	5.80
1966-67	123	6.30
1967-68	76	3.94

In addition, the laboratories have been rendering technical assistance and advice free of charge to Government departments, public sector undertakings and a large number of small scale industries.

### Technical Information Service

The information units of the laboratories and the Research Coordination and Industrial Liaison Division at the Headquarters handle a number of enquiries received from the Government organisations, industries and individuals. The enquiries relate mostly to the processes and products, technical data, standards and specifications, etc. Sometimes comprehensive notes are furnished in response to such enquiries. Number of such enquiries dealt at the laboratories during the last few years is given below:

	<i>Number of enquiries</i>	<i>No. of technical and non-technical notes sent</i>
1964	6553	561
1965	9280	567
1966	12622	1212
1967-68	15810	951

The Technical Information Centre for Chemical Industry (TICCI) established at Bombay in collaboration with the Indian Chemical Manufacturers Association provided technical information and data to the chemical industry. During the year (1967) it attended to 1575 enquiries.

The R.C. & I.L. Division of the Council is issuing a quarterly "Information News Letter" and a monthly "Data on Research Utilisation" to disseminate research activities of the Council and a compilation reflecting utilisation of results of research respectively. The TICCI continues to issue its monthly News Letter.

### Standardization and Quality Control Service

The laboratories are equipped with sophisticated equipment and instrument to undertake testing and analysis of raw materials and finished products, calibration and repair of instruments, etc. These facilities are being increasingly utilized by the Government Departments and industries.

	<i>Number of samples tested/instruments repaired</i>	<i>Fee charged Rs.</i>
1964	25,843	3,31,544
1965	28,589	5,76,255
1966	28,468	7,68,695
1967-68	25,175	8,20,640

### Industrial Research for User Organisations

The CSIR laboratories have been encouraging the participation of industries and user organisations in scientific and industrial research and this

is reflected by the number of schemes and projects sponsored by them. During 1967-68, 178 schemes financed wholly or partially by the sponsoring authority were in operation in 18 of the National Laboratories and Institutes. Work on 39 such schemes was completed. These schemes primarily relate to development of processes for new products; upgrading, standardisation and utilisation of indigenous raw materials and solution of specific problems.

In addition to the above schemes, the laboratories undertook investigations on 68 schemes/items of work particularly at the instance of Government or public sector organisations without any financial participation.

### **Schemes for Basic Scientific Research**

During the year 1967-68, 39 schemes on basic scientific research were in operation in 11 of the CSIR laboratories financed mainly by the International Organisations and Government Departments.

This publication makes no claim at any exhaustive coverage of all the activities of the CSIR and its Laboratories which are diverse in nature and contribute in more than one way to the scientific and industrial development. Only the more specific fields of activity whereby the CSIR Laboratories have made tangible contribution towards assisting the scientific development and industrial growth have been listed.

## RESEARCH UTILIZATION DATA (1967-68) AT A GLANCE

1. Processes in production :	number of released processes to industry reported in production	...	144
	number of processes in departmental production	...	33
2. Other processes released :	royalty/premium basis	...	96
	technical assistance on payment	...	47
3. Processes released free of charge :	number of processes adopted by industry... released during 1967-68	...	23 31
4. Processes available for exploitation		...	362
5. Sponsored research schemes :	sponsored industrial research schemes ... schemes/work undertaken at the instance of user organisation free of charge ...	...	178 68
6. Sponsored projects for basic scientific investigations		...	39
7. Consultation, design and engineering services		...	76
8. Project reports supplied		...	98
9. Pilot plants/projects :	continuing as on 31.3.1968 completed during 1967-68	...	126 17
10. Analysis, testing and other services :	samples fee (Rs.)	...	25,175 8,20,640
11. Enquiries :	number received technical notes	...	15,810 951
12. Demonstration and extension work :	number of demonstrations number of laboratories	...	232 12
13. Number of patents (1967-68)	In India : filed accepted sealed Abroad : filed accepted sealed	...	146 79 68 12 13 9

TABLE 1 — PROCESSES IN PRODUCTION BY INDUSTRIES

( As on 1st April, 1968 )

Sl. No.	Process	Party (Year of release)	Terms	Year of commence- ment of production		1967-68		Since commencement of production	
				Quantity	Value	Quantity	Value	Quantity	Value
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
<b>CHEMICALS</b>									
<b>Heavy Chemicals</b>									
1.	Calcium sulphate, anhydrous, Pat. No. 82190 (RRL, Hyderabad)	Keshavgiri Industries, (1964)	Chemical Hyderabad	Premium—Nil Royalty—2½% Non-exclusive	1965	n.a.	n.a.	10.5 tonnes	61,500
		Muhana Co., (1967)	Shegaon -do-	—					
2.	Potassium chloride and epsom salt, Pat. No. 67461 (CSMCRI)	United Salt & Industrial Works Ltd., (1965)	Industrial Kandla	Under negotiation	1966			Pilot plant production	
3.	Sodium azide (RRL, Hyderabad)	Libra Chemicals, Hyderabad (1967)		Premium—Nil Royalty—2½% Non-exclusive	1967	1,030 kg.	1,64,800	1,030 kg.	1,64,800
<b>Organic Chemicals and Intermediates</b>									
4.	Benzyl chloride, Pat. No. 71864 (RRL, Hyderabad)	Hyderabad Chemicals & Pharmaceutical Works, Hyderabad (1961) (Organic India Pvt. Ltd., Hyderabad)		Premium—Nil Royalty—2½% Non-exclusive (Paid Rs 10,000 for turnkey job)	1965			Trial production	

Gujarat Oil Mills & Manufacturing Co. Ltd., Ahmedabad (1966)	-do-	—	—	—	—	—	—	—
5. Chloroform (RRL, Hyderabad (1965))	Commercial Chemical Co. (India) Pvt. Ltd., Hyderabad (1965)	7½% on plant Non-exclusive Turnkey job	erected	1963	26,852 kg.	1,61,112	63,792 kg.	4,24,452
Arun Chemicals and Pharmaceutical Works, Hyderabad (1967)	-do-	—	—	—	—	—	—	—
6. Ethylene oxide condensate (NCL)	Hico Products Pvt. Ltd., Khopali (1965)	Rs. 12,000 Sponsored Research	—	1965	241 tonnes	22,72,746	421 tonnes	44,36,346
7. Hexyl resorcinol, Pat. No. 57888 (NCL)	Unichem Laboratories Ltd., Bombay (1960)	Premium—Rs. 2,500 Royalty—2½% Exclusive	1964	nil	nil	13 kg.	7,800	—
8. 4-Hydroxycoumarin, Pat. No. 62890, 63083 (NCL)	Unichem Laboratories Ltd., Bombay (1960)	Premium—Rs. 10,000 Royalty—7½% Exclusive	1963	9.5 kg.	5,130 (approx.)	56.80 kg.	30,670 (approx.)	—
<b>Agro-Chemicals (Fertilizer and Pesticides)</b>								
9. DDT water dispersible, as an oil bound paste, Pat. No. 56726 (NCL)	South India Research Institute Pvt. Ltd., Vijayawada (1961)	Premium—Nil Royalty—2½% Non-exclusive	1963	526 kg.	4,383	19,614 kg.	1,33,592	—
Pesticide Ltd., Bombay (1960)	Gajanand Ramkishan, Beawar (1964)	-do-	—	—	—	—	—	—
Lotus Industries, Madras (1966)	-do-	1968	Started production	—	—	—	—	—

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10. Nicotine sulphate from tobacco and tobacco waste Pat. No. 45666, 54867 (NCL)	Urvkunj Tobacco By-products, Dharmaj (1960)	Premium—Rs. 2,000 Royalty—1% Zonal (Maharashtra & Gujarat)	1964	5,00 kg.	80,000	15,268 kg.	1,98,377	
	Tobacco Byproducts Ltd., Guntur (1954)	Non-exclusive for South Zone	—					
	National Byproducts, Saharanpur (1962)	Tobacco Zonal (North)	—					
	M. M. Patel, (Gujarat) (1966)	Sunav Zonal (Maharashtra & Gujarat)	—					
<b>Resins and Plastics</b>								
11. Anion exchange resins from melamine, Pat. No. 71190 (NCL)	Tulsi Industries, Poona (1963)	Premium—Rs. 2,000 Royalty—3% Non-exclusive	1963	14 cu.m.	1,55,400	15 cu.m.	1,67,072	
(CFRI)	Bird & Co., (1955)	Calcutta	Premium—Rs. 25,000 Royalty—5% Exclusive for India	1956	nil	1,346.8 cu.m.	29,42,553	
	Dr. C. Otto & Co., Calcutta (1955)	Premium—Rs. 50,000	Ten countries in Europe	—				
13. Cation exchange resins from cashewnut shell liquid, Pat. No. 59497, 59606 (NCL)	Tulsi Industries, Poona (1960)	Premium—Rs. 7,500 Royalty—5% Exclusive	1961	3.5 cu.m.	14,410	237.8 cu.m.	6,07,464	

## Resins and Plastics

11. Anion exchange resins from melamine, Pat. No. 71190 (NCL)	Tulsi Industries, Poona (1963)	Premium—Rs. 2,000 Royalty—3% Non-exclusive	14 cu.m.	1,55,400	15 cu.m.	1,67,072
12. Carbon, Pat. No. 47446 (CFRI)	Bird & Co., (1955)	Calcutta	Premium—Rs. 25,000 Royalty—5% Exclusive for India	nil	1,346.8 cu.m.	29,42,553
	Dr. C. Otto & Co., Calcutta (1955)		Premium—Rs. 50,000 Ten countries in Europe	—		
13. Cation exchange resins from cashewnut shell liquid, Pat. No. 59497, 59606 (NCL)	Tulsi Industries, Poona (1960)		Premium—Rs. 7,500 Royalty—5% Exclusive	3.5 cu.m.	14,410	237.8 cu.m.

14. Polyurethane base printing rollers, Pat. No. 86991 (NCL)	Sree Saraswaty Press Ltd., Calcutta (1965)	Premium—Rs. 5,000 Royalty—5% Non-exclusive	1966	Trial production
	Dobholkar Bros. Ltd., Poona (1964)	-do-	—	
	United Ink & Varnish Co., Bombay (1966)	-do-	—	
15. Resin from tar oil fraction Pat. No. 56581 (CFRI)	Durgapur Project Ltd., Calcutta (1963)	Premium—Rs. 2,000 Royalty—Rs. 50/tonne Non-exclusive	1963	1,97,967 kg. 3,22,170
		nil	nil	
16. Styrene DVB base cation exchange resin, Pat. No. 65976 (NCL)	Industrial & Agricultural Engg. Co. Pvt. Ltd., Bombay (1962)	Premium—Rs. 15,000 Royalty—5% Non-exclusive	1967	0.27 cu.m. 2700
	Tulsi Industries, Poona (1962)	-do-	—	
	Bird & Co., Calcutta (1965)	-do-	—	
<b>Pigments, Paints and Enamels</b>				
17. Cardanol and other products based on cardanol and CNSL (RRL, Hyderabad)	Card Chem. Industries, Hyderabad (1967)	Premium—Rs. 10,000 Royalty—1% Non-exclusive (Two firms)	1967	— 1,07,500 — 1,07,500
18. Cement paints (CBRI)	Bhagson Paint Industries (India), New Delhi (1965)	Premium—Rs. 1,000 Royalty—2½% Non-exclusive	1966	Sample production
	Bonita India Ltd., New Delhi (1966)	-do-	1966	n.a. 611 kg. 1,636

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Hyderabad Oil & Paint Co., Hyderabad (1966)	Premium—Rs. 1,000 Royalty—2½% Non-exclusive	1967						
Jawan Industrial Enterprises, Ernakulam (1967)	-do-	—						
Dr. M. I. Itty, Southern Corporation, Alleppey (1967)	-do-	1968						
19. Cuprous oxide—electrolytic preparation of, Pat. No. 52394, 56532 and 58352 (CECRI)	Pigment & Chemicals (India) Pvt. Ltd., Calcutta (1957)	Premium—Rs. 5,000 Royalty—2½% Non-exclusive	1957	nil		22,050 kg.	1,05,830	
20. Vitreous enamels for wire wound resistors, Pat. No. 48419, 49425, 52111 (CGCRI)	Beni Ltd., Calcutta (1955)	Premium—Rs. 4,000 Royalty—3½% Exclusive	1959	986 kg.	10,779	7,530 kg.	76,171	
<b>Inks</b>								
21. BCG marking ink (NPL)	Mysore Lac & Paint Works Ltd., Mysore (1963)	Premium—Nil Royalty—2½% Exclusive	1965					
22. Duplicating and allied inks Pat. No. 40257 (NPL)	Mysore Lac & Paint Works Ltd., Mysore (1958)	Premium—Rs. 10,000 Royalty—2½% Exclusive	1959	94,309 kg.	5,66,593		9,07,174 kg.	43,64,165
23. Indelible ink (NPL)	Mysore Lac & Paint Works Ltd., Mysore (1961)	Premium—Rs. 5,000 Royalty—2½% Exclusive	1961	38,404 phials	99,121		10,30,769 phials	14,72,022

### Adhesives

24. Can sealing composition Pat. No. 66194 (NCL)	Arya Chemical Works, Calcutta (1959)	Premium—Rs. 3,000 Royalty—3½% Exclusive	1961	23,259 kg.	1,22,000	94,859 kg.	4,91,611
25. Latex cement, Pat. No. 66298 (CLRI)	Kanjirappally Small Scale Rubber Ind. Co-operative Society Ltd., Kanjirappally (1961)	Premium—Nil Royalty—2½% Non-exclusive	1962	12,038 litres	61,002	46,315 litres	2,29,213
	K. N. Chari & Co., Madras (1963)	-do-	1963	n.a.	n.a.	4,699 litres	22,505
	Rubber Adhesive Products, Kottayam (1966)	-do-	1967	14,430 litres	73,770	16,332 litres	83,926
	Coromandel Chemicals, Madras (1966)	-do-	—	—	—	—	—
	Bhagson Paint Industries, New Delhi (1967)	-do-	—	—	—	—	—
26. Liquid rubber, Pat. No. 60555 (NCL)	K. N. Chari & Co., Madras (1961)	Premium—Rs. 5,000 Royalty—Nil Non-exclusive	1962	nil	nil	1,700 kg. resin 2,200 litres liquid	4,189
	Swastik Rubber Products Ltd., Poona (1958)	-do-	—	—	—	—	—
27. Rubber base contact adhesives, Pat. No. 65977 (NCL)	K. N. Chari & Co., Madras (1961)	Premium—Nil Royalty—2½% Non-exclusive	1962	3,250 litres	15,500	17,758 litres	52,148
	Manchester Chemical Corp., Bombay (1961)	-do-	—	—	—	—	—

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Laxmi Stores, Bombay (1961)		Premium—Nil Royalty—2½% Non-exclusive	—					
Swastik Industries, Poona (1961)		-do-	—					
R.M. Dhoot, Poona (1961)		-do-	—					
Hira Industries, Poona (1961)		-do-	—					
Bhagson Paint Industries, New Delhi (1967)		-do-	—					
<b>Cellulose and Paper</b>								
28. Refining of cotton linters (RRL, Hyderabad)		Cellulose Products of India Ltd., Ahmedabad (1959)	Rs. 2,000 Non-exclusive	1961	800 M.T.	20,00,000	2,786 M.T.	67,26,000
<b>OTHER INDUSTRIAL CHEMICALS</b>								
29. Anti-priming composition, Pat. No. 77081 (NCL)		Research, Design & Standards Organisation, Ministry of Railways, Chittaranjan (1964)	Premium—Nil Royalty—2% Sponsored Research	1964	18,700 kg.	42,429	60,318 kg.	1,22,743
30. Anti-rust solution (NPL)		Mysore Lac & Paint Works Ltd., Mysore (1961)	Premium—Nil Royalty—2½% Non-exclusive	1962	—	15,165	—	34,293
		Plastipeel Corporation, (1961)	Chemical Bombay	-do-	1962	82,133 litres	1,35,300	2,47,034 litres 3,83,648

31. Catalyst for removal of inorganic sulphur from industrial gases, Pat. No. 55816 (CFRI)	Durgapur Projects Ltd., Calcutta (1962)	Premium—Rs. 25,000 Royalty—Rs. 5/tonne for quantity consumed by project and Rs. 10/tonne sold outside	1964	97.6 tonnes	41,650 tonnes	281.6	1,20,450
32. Dye penetrants for crack detection, Pat. No. 98152 (CFRI)	Pioneer Equipment Co. Pvt. Ltd., Calcutta (1966)	Premium—Nil Royalty—2% Exclusive	1967	965.5 litres	17,709	1,002.5 litres	18,388
33. Lisasorb, Pat. No. (CFRI)	New Mac Industries, Ahmedabad (1957)	Premium—Rs.20,000 Royalty—5% Exclusive	1958	47,685 kg.	2,40,000	2,80,670 kg.	13,89,020
34. VPI Anticorrosive Pat. No. 101924 (CECRI)	Kores India Ltd., Bombay (1966)	Premium—Rs. 5,000 Royalty—2½% (Min. Rs. 2500 p.a.) Non-exclusive	1967	—	—	—	—
	Rolls Print Co. Pvt. Ltd., Calcutta (1966)	-do-					
<b>FOODS AND BEVERAGES</b>							
<b>Food Products</b>							
35. Active Dry Baker's yeast (CFTRI)	Mohanan Breweries, Ghaziabad (1960)	M e a k i n Royalty—Nil Exclusive	1967	Premium—Rs. 16,000 Royalty—Nil	—	—	Trial production
36. Composite protein food, Pat. No. 47580 (CFTRI)	Unichem Laboratories Ltd., Bombay (1958)	Premium—Rs. 1,500 Royalty—2½% Exclusive	1959	5,138 kg.	1,55,938	15,991 kg.	4,79,518
37. Groundnut protein isolate (CFTRI)	Tata Oil Mills Co. Ltd., Bombay (1967)	Premium—Nil Royalty—3P./kg. Non-exclusive	1967	1,11,936 kg.	—	1,11,936 kg.	—

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
38. Infant food from milk (CFTRI)	buffalo	Kaira Distt. Cooperative Milk Producers' Union Ltd., Anand (1958)	Premium—Nil Royalty—2p/lb. for first 2 yrs. and 4p/lb. for 12 yrs. Exclusive	1960	30,17,987 kg.	2,60,10,000	15,20,9293	11,88,73,570
39. Pectin and tamarind fruit pulp, Pat No. 52167 (CFTRI)	tartrate from tamarind fruit pulp, Pat No. (1961)	Hindustan Dyestuffs & Chemicals, Ahmedabad (1961)	Premium—Nil Royalty—2½% Non exclusive	1966	Trial production	—	—	—
<b>Beverages</b>								
40. Tonic wine (CFTRI)	F. K. Research Products, Mysore (1957)	Premium—Rs. 500 Royalty—12 p. per bottle of 750 ml. (Min. Rs. 2,000 p.a.) Exclusive	1959	—	26,318	—	—	1,80,580
<b>Fruits and Vegetables</b>								
41. Cashew kernels, improving storage life of cashew kernels, Pat. No. 53319 (CFTRI)	Colonial Distributors, Irinjalakuda (1962)	Premium—Nil Royalty—1% (Min. Rs. 250 p.a.) Non-exclusive	1962	—	—	Minimum royalty of Rs. 250 per year	—	—
Trichur Fruit & Vegetables Marketing Cooperative Society Ltd., Trichur (1961)	-do-	1964	—	—	—	Minimum royalty of Rs. 250 per year	—	—
N. Sundereswaran, Quilon (1961)	-do-	1960	—	—	—	Minimum royalty of Rs. 250 per year	—	—
Super Industries, Sasthamcotta (1962)	-do-	—	—	—	—	Minimum royalty of Rs. 250 per year	—	—

## Condiments

42.	Garlic powder, Pat. No. 65138 (CFTRI)	Patel Amin & Co., Odhav (1961)	Premium—Rs. 2,000 Royalty—Nil Non-exclusive	nil	30,000
	Gargin & Pepard Ltd., Madras (1962)	-do-	1966	2,067 kg.	2,000 kg.
	Ramgopal Aniya & Co., Neemuch Cann. (1964)	-do-	—	63,255	75,880

## Processing equipment

43.	Batch type spin cooker cooler for the processing of canned acid foods, Pat. No. 69697 (CFTRI)	Gardners Corporation, New Delhi (1960)	Premium—Rs. 2,000 Royalty—6½% Exclusive	nil	17,600
44.	Vacuum tester for canned foods, Pat. No. 63659 (CFTRI)	Gardners Corporation, New Delhi (1960)	Premium—Rs. 1,000 Royalty—6½% Exclusive	nil	9,525

## OILS AND WAXES

45.	Hydrogenated castor oil, Pat. No. 104197 (RRL, Hyderabad)	Bombay Oil Industries Pvt. Ltd., Bombay (1963)	Premium—Rs. 10,000 Royalty—Rs. 20/tonne Non-exclusive	357.7 tonnes	14,21,728
46.	Extraction and utilization of sisal wax, Pat. No. 64958, 65440 (NCL)	Aphali Ltd., Ahmednagar (1960)	Pharmaceuticals Ahmednagar	Premium—Nil Royalty—2½% Non-exclusive	1,027.9

Jayshree Trading Corporation, Calcutta (1961)

-do-

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Industrial & Engg. Corporation, Calcutta (1962)		Premium—Nil Royalty—2½% Non-exclusive	—					
Shalimar Rope Works Ltd., Calcutta (1965)		-do-	—					
Deccan Paints & Chemicals Industries, Howrah (1967)		-do-	—					
<b>GLASS, CERAMICS, REFRactories AND CLAY</b>								
<b>Glass</b>								
47. Glass and calomel electrodes for pH meter (CCRI) (NML)		Electronic & Industrial Instruments Co. Pvt. Ltd., Hyderabad (1965)	Premium—Nil Royalty—Rs. 2,000/yr. Non-exclusive	1966	300 nos.	26,000	540 nos.	47,600
<b>Refractories</b>								
48. Graphite crucibles (carbon bonded), Pat. No. 58869 (NML)		Patna State Graphite Mining Co., Titilagarh (1958)	Premium—Rs. 25,000 Royalty—4% Non-exclusive	1963	1,63,090 nos.	2,66,900	8,12,892 nos.	12,49,900
		Mattapalli Satyam & Sons, Samalkot (1967)	-do-	—				
49. Graphite crucibles (clay bonded), Pat. No. 62352 (NML)		Maheswary Udyog, Vijayawada (1960)	Premium—Rs. 2,000 Royalty—4% Non-exclusive	1965	nil	1,22,919 nos.	90,201	
		Patna State Graphite Mining Co., Titilagarh (1959)	-do-	—				
		J. D. Jones & Co. Ltd., Calcutta (1966)	-do-	—				

50. Hot face insulation refractories, Pat. No. 59456 (CGCRI)	Kumar Manufacturing Co., Howrah (1963)	Premium—Rs. 2,000 Royalty—2½% Non-exclusive	1964	n.a.	n.a.	243 nos.	1,193
51. Mica insulating bricks and blocks, Pat. No. 48667 (CGCRI)	Bhupal Mining Works, Bhilwara (1956)	Premium—Rs. 10,000 Royalty—2½% Zonal (North-West Zone)	1958	8,00,000 nos.	8,00,000 nos.	93,21,694 nos.	1,22,49,855
	Reliance Fire Bricks & Pottery Co. Ltd., Calcutta (1956)	Premium—Rs. 25,000 Royalty—2½% Zonal (Eastern Zone)	1958	13,137 nos.	11,124	3,97,205 nos.	5,95,014
	Andhra Pradesh Mining Corp., Hyderabad (1962)	Premium—Rs. 10,000 Royalty—2½% Zonal (South Zone)	1965	58,125 nos.	72,400	1,41,157 nos.	1,93,390
52. Pyrometric cones, standard (RRL, Hyderabad)	Micro Ceramics Pvt. Ltd., Hyderabad (1966)	Premium—Nil Royalty—6% Exclusive	1968	13,426 nos.	2,010	13,426 nos.	2,010
<b>Clays and Abrasives</b>							
53. Bleaching earths (RRL, Hyderabad)	Korvi Fuller's Earth Processing Industry, Gubarga (1964)	Premium—Nil Royalty—5% Non-exclusive	1965	n.a.	n.a.	n.a.	n.a.
54. Grinding wheel for safety razor blades, Pat. No. 103959 (CGCRI)	Harbansl Malhotra & Sons Pvt. Ltd., Calcutta (1966)	Premium—Rs. 15,000 Royalty—Rs. 4,000/yr. Non-exclusive	1967	Minimum royalty of Rs. 4,000 p.a.			
<b>LEATHER AND AUXILIARIES</b>							
55. Acryl resin emulsion (CLR)	Amar Dye-Chem. Ltd., Bombay (1967)	Premium—Nil Royalty—2½% Non-exclusive -do-	1968	165 kg.	1,571	165 kg.	1,571

## Clays and Abrasives

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
56. Alkyd resin emulsion for glossy water fast finish (CLRI)	Coromandel Chemicals Ltd., Madras (1967)	Premium—Nil Royalty—2½% Non-exclusive	1967	185 kg.	955	185 kg.	955	
57. Belting cement (CLRI)	Coromandel Chemicals Ltd., Madras (1967)	Premium—Nil Royalty—2½% Non-exclusive	1967	1,660 kg.	15,930	1,660 kg.	15,930	
58. Enzyme depilants and bates, Pat. No. 52670, 54998, 64354 (CLRI)	Leather Chemicals & Industries Ltd., Calcutta (1961)	Premium—Nil Royalty—2½% Non-exclusive	1964	7,670 kg.	29,470	29,163 kg.	90,267	
	Coromandel Chemicals Ltd., Madras (1966)	-do-	1967	1,625 kg.	5,680	4,077 kg.	13,324	
59. Hide powder (CLRI)	Coromandel Chemicals Ltd., Madras (1966)	Premium—Nil Royalty—2½% Exclusive	1966	5 kg.	625	13 kg.	1,625	
60. Lacquers and emulsion (CLRI)	Coromandel Chemicals Ltd., Madras (1967)	Premium—Nil Royalty—2½% Non-exclusive	1967	2,055 kg.	22,720	2,055 kg.	22,720	
61. Lac resin top dress (CLRI)	Coromandel Chemicals Ltd., Madras (1967)	Premium—Nil Royalty—2½% Non-exclusive	1967	242 kg.	935	242 kg.	935	
62. Shower proofing (CLRI)	Coromandel Chemicals Ltd., Madras (1967)	Premium—Nil Royalty—2½% Non-exclusive	1967	529 kg.	5,560	529 kg.	5,560	
63. Syntans (CLRI)	Indoplast Ltd., Bombay (1965)	Premium—Nil Royalty—2½% Non-exclusive	1967	Trial production	—	Trial production	—	
	Allied Resins & Chemicals Ltd., Calcutta (1965)	-do-						

Indofil Chemicals Ltd.,  
Bombay (1966)

—

64. Wax dispersion for leather finishing (CLRI) Coromandel Ltd., Madras (1967) Chemicals Premium—Nil Royalty—2½% Non-exclusive 1967 430 kg. 1,759 430 kg. 1,759 1,759

#### COAL AND CARBON PRODUCTS

##### Coal Fuel

65. Chain grate stokers moving bed devolatilization process for coal, Pat. No. 61020 (CFRI) Coke Oven Construction Co. Pvt. Ltd., Calcutta (1961) (Plant Sri Narsing Industries, Hyderabad) Premium—Rs. 50,000 Royalty—Nil Exclusive 1967 300 tonnes 45,000

##### Carbon Products

66. Carbon slab and rod material used for making brushes for electrical machinery (NPL) Beni Ltd., (1954) Calcutta Premium—Nil Royalty—3½% Non-exclusive 1957 9,731 kg. 1,89,138 56,102 kg. 12,06,933

Assam Carbon Products, Calcutta (1961) -do- 1964 nil nil — 14,850

Best & Co. Pvt. Ltd., Madras (1962) -do- —

Lead Slips Products Pvt. Ltd., Ahmedabad (1963) -do- —

67. Porous carbon electrodes for air depolarised cells Pat. No. 90957 (CECRI) Carbon Industries Pvt. Ltd., Madras (1964) Premium—Rs. 10,000 Royalty—5% Non-exclusive 1965 1,02,426 nos. 13,60,775 1,07,361 nos. 14,28,324

## METALS AND ALLOYS

### Metals

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<b>Metals</b>								
68. Aluminium	lithoplates	Reprografix Pvt. Ltd., Sivakasi (1966)	Premium—Rs. 10,000 Royalty— $2\frac{1}{4}\%$ Non-exclusive					Trial production
Pat. No. 96606 (CECRI)				Vyankatesh Pai, Bombay (1967)	-do-			
55289, 57938 and 65230 (NML)		Lalchand Howrah (1962)	Premium—Nil Royalty— $2\frac{1}{4}\%$ Non-exclusive					
				Rungta Engg. & Construction Co. Pvt. Ltd., Calcutta (1962)	-do-			
				Excelsior Commercial Corporation, Bombay (1962)	-do-			
				Gujarat Steel Industries, Ahmedabad (1962)	-do-			
				Iron Products (Assam) Ltd., Calcutta (1962)	-do-			
				Shri K. Srinivas, New Delhi (1962)	-do-			
				Orient Wire Industries Pvt. Ltd., Calcutta (1963)	-do-			
				Golden Shaft & Wire Industries, Howrah (1963)	-do-			

Sukhraj Ray Abhay-kumar, Bhagpalpur (1963)	-do-	-	-	-
Electrical Manufacturing Co. Ltd., Calcutta (1963)	-do-	-	-	-
Shiva Wire & Steel Products, Calcutta (1964)	-do-	-	-	-
Wens Aluminisers, New Delhi (1964)	-do-	-	-	-
Orissa Wire Products Ltd., Cuttack (1965)	-do-	-	-	-
Bharat Aluminising Corpn. Ahmedabad (1965)	-do-	-	-	-
Assam Conductors & Tubes (P) Ltd., Gauhati (1965)	-do-	-	-	-
Venkata Durga Aluminising Works, Nandigama (1965)	-do-	1968	125 tonnes	1,75,000
Ramswarup Industrial Corpn., Calcutta (1965)	-do-	-	-	-
East India Wire Industries, Calcutta (1965)	-do-	-	-	-
Aluminising Coatings & Castings, New Delhi (1965)	-do-	-	-	-
D. S. Chawbe & Sons Pvt. Ltd., Calcutta (1966)	-do-	-	-	-

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Paramount Iron & Steel Works Pvt. Ltd., Sonepat (1966)		Premium—Nil Royalty—2½% Non-exclusive	—					
Technology Syndicate, Ranchi (1966)		-do-	—					
The Navsari Processing Industries Pvt. Ltd., Maroli (1966)		-do-	—					
The General Manager, P & T Workshop, Calcutta-1 (1966)		-do-	—					
Hindustan Construction and Commercial Corporation, Calcutta (1966)		-do-	—					
Ct. Algappan, Madras (1966)		-do-	—					
Bonita India Ltd., New Delhi (1966)		-do-	—					
Rainbow Industries, Indore (1966)		-do-	—					
K. Ramakrishna, Vijaywada (1967)		-do-	—					
<b>Metal Powders</b>								
70. Iron powder, electrolytic (Cf.CRI)	Chettinad chemicals (1965)	Electro- Avanipatti	Premium—Rs. 6,000 Royalty—2½% Exclusive	1966	6,61.5 kg.	49,610	9,735 kg.	73,393

71. Iron powder for autogenous cutting, Pat. No. 96017 (NML) Electric Control Gear Pvt. Ltd., Ahmedabad (1963) Premium—Rs. 10,000 1966 Royalty—2½% Non-exclusive (Two licences) —

Indian Oxygen Ltd., Calcutta (1963) -do-

### Alloys

72. Carbon-free ferro alloys by aluminothermic reaction, Pat. No. 65231 (NML)	Electric Control Gear Pvt. Ltd., Ahmedabad (1963)	Premium—Rs. 7,500 1965 Royalty—2½% Non-exclusive	90,184 kg. 14,46,000	1,07,876 kg. 16,34,620
	R. Sen & Co., Calcutta (1964)	-do-	1966 n.a. n.a.	15,052 kg. 1,03,700
	Sain Dass Kishan Chand Mehra, Amritsar (1964)	-do-	1966 36,204 kg. 3,59,200	42,396 kg. 4,08,970
	Jeypore Sugar Mills Co., Madras (1966)	-do-	—	—
<b>ELECTRONIC COMPONENTS</b>				
73. Ceramic capacitors, Pat. No. 53372, 53462, 53528, 53817, 54263 (NPL)	Bharat Electronics Ltd., Bangalore (1960)	Premium—Nil Royalty—2½% Non-exclusive	17,70,145 nos. 3,61,400	1,49,89,336 nos. 31,62,760
74. Ceramic rods for carbon resistors, Pat. No. 92277 (NPL)	Micro Ceramics Ltd., Hyderabad (1964)	Premium—Nil Royalty—2½% Non-exclusive	25,81,200 nos. 40,980	30,32,200 nos. 50,965
	Caledonian Jute Mills Co. Ltd., Khurja (1966)	-do-	1967 3,65,650 nos. 5,755	3,65,650 nos. 5,755
75. Hard ferrites, Pat. No. 93725 (NPL)	Power Agents, New Delhi (1965)	Premium—Nil Royalty—2½% Non-exclusive	—	—
	Swastik Rubber Products, Poona (1965)	-do-	—	—

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Ceramic Magnets and Electronic Co., Madras-2 (1966)	Premium—Nil Royalty—2½% Non-exclusive	—				
		Matchwel Electricals Pvt. Ltd., Poona (1966)	-do-	1968		Trial production		
		Epro International Ltd., Poona (1967)	-do-	1968		Trial production		
76.	Silver mica capacitors, Pat. No. 53528 (NPL)	Indian Telephone Industries, Bangalore (1956)	Premium—Nil Royalty—2½% Exclusive for two parties	1959	1,00,33,077 nos.	12,07,000	3,52,93,647 nos.	43,22,446
		Manilal Mohanlal & Co., Bombay (1959)	-do-	1960	11,33,500 nos. caps.	1,25,755	1,09,57,378 nos. caps.	34,70,701
							85,16,500 nos. plates	
77.	Soft ferrites, Pat. No. 87993 (NPL)	Morris Electronics Pvt. Ltd., Poona (1964)	Premium—Nil Royalty—2½% Non-exclusive	1965	—	8,74,504	—	14,44,796
		Semiconductors Ltd., Poona (1964)	-do-	1965	—	2,46,224	—	3,28,986
		Singhson Ferrites Pvt. Ltd., Delhi (1965)	-do-	—	—	—	—	—
		U. M. S. Radio Factory, Coimbatore (1966)	-do-	—	—	—	—	—
		Ferrite India, Faridabad	-do-	—	—	—	—	—
		Ferro Electronics Pvt. Ltd., Hyderabad	-do-	—	—	—	—	—

## STRUCTURES AND BUILDING MATERIALS

### Structures

78. Economic steel structures, Pat. No. 112207 (CMERI)	Rourkela Ltd., Rourkela (1965)*	Fabrication	2½% of the cost of structures	1966	4,74,660
	*Exclusive for Orissa				
EMC Project Pvt. Ltd., Calcutta (1965)	Non-exclusive	1966	n.a.	n.a.	—
Khandelwal Udyog Ltd., Bombay (1965)	Non-exclusive	1966			
Steelworth Pvt. Ltd., Tinsukia (1965)	Non-exclusive	1966			
<b>Building Material</b>					
79. Foaming agents for the production of low density foam concrete, Pat. No. 58909 (CBRI)	Hindustan Housing Factory, New Delhi (1958)	Premium—Nil Royalty—2½% on sale Exclusive for North India	1959	Producing for their own use	
80. Jet sealing compound, Pat. No. 92526, 95305, 96710 (CRRRI)	Paul Babula & Co., New Delhi (1967)	Premium—Rs. 5,000 Royalty—3% Non-exclusive	1967	7,750 kg. 17,437	7,750 kg. 17,437
81. Lime reactive surkhi, Pat. No. 90470 (CRRRI)	Bhaskar Pozzolanics, New Delhi (1965)	Premium—Rs. 2,000 Royalty—2% Non-exclusive	1966	144 tonnes 10,080	294 tonnes 25,080
	V. P. Jain, Calcutta (1964)	-do-		—	
	Mineral & Industrial Corporation, Madras (1965)	-do-		—	
	Sepulchre Bros. (India) Ltd., Bombay (1965)	-do-		—	
	Bombay Machinery Co., Delhi (1967)	-do-		—	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
82. Reactive surkhi, Pat. No. 93726 (CRRI)	Bhaskar New Delhi (1967)	Pozzolanics, Sepulchre Bros. (India) Ltd., Bombay (1965)	Premium—Rs. 1,000 Royalty—1% Non-exclusive	1967	36 tonnes	2,520	36 tonnes	2,520
		-do-	—					
		Bombay Machinery Co., Delhi (1967)	-do-	—				
<b>Building Aids</b>								
83. Auger Boring Guide, Pat. No. 82303 (CBRI)	MSJ (Engineers) & Co., Roorkee (1964)	Premium—Nil Royalty—5% Exclusive	1964	106 nos.	27,136	348 nos.	84,418	
84. New Soil Sampler, Pat. No. 91411 (CBRI)	MSJ (Engineers) & Co., Roorkee (1966)	Premium—Nil Royalty—5% Exclusive	1967	11 nos.	3,905	12 nos.	4,405	
85. Portable under reaming tool, Pat. No. 54907 (CBRI)	MSJ (Engineers) & Co., Roorkee (1959)	Premium—Rs. 1,000 Royalty—2½% Exclusive	1959	96 nos.	28,414	586 nos.	1,44,926	
86. Pressure measuring device (CBRI)	Associated Instruments Manufacturers Pvt. Ltd., New Delhi (1966)	Premium—Rs. 2,000 Royalty—2½%	1967	4 nos.	1,400	4 nos.	1,400	
87. Tamping machine, Pat. No. 107725 (CBRI)	MSJ (Engineers) & Co., Roorkee (1967)	Premium—Rs. 2,000 Royalty—3% Non-exclusive	1967	1 no.	700	1 no.	700	
		-do-	—					
		Roorkee Engineering Co., Roorkee (1967)						

APPLIANCES, INSTRUMENTS AND PLANTS

**Electrical and Electronic Equipment**

88. Carlson strain meter (NPL)	Precision Corporation, (1967)	Instrument	Premium—Nil Royalty—Rs. 45 per instrument plus Rs. 15 for testing charges	1968	Production started
89. Counter frequency meter Model 411 L (csio)	Oriental Science Apparatus Workshop, Ambala Cantt. (1967)	meter	Royalty—First five piece—Nil Next 20 pcs.— $2\frac{1}{2}\%$ Thereafter 5% Exclusive for 3 yrs. Non-exclusive for 7 yrs.	1967	1 no.
90. Decade scaler Model 403 L (csio)	Oriental Science Apparatus Workshop, Ambala Cantt. (1967)	-do-	-	1967	3 nos.
91. Four point resistivity probe (CEERI)	Oriental Science Apparatus Workshop, Ambala Cantt. (1965)		Premium—Rs. 4,500 Royalty—Nil Non-exclusive	1965	nil
92. Stabilised D. C. power supply Model 502 L (csio)	Oriental Science Apparatus Workshop, Ambala Cantt. (1966)		Royalty—First five pieces—Nil Next 20 pcs.— $2\frac{1}{2}\%$ Thereafter —5% Exclusive for 3 yrs. Non-exclusive for 7 yrs.	1966	5 nos.
93. Thermistors (NCL)	Semiconductor Ltd., Poona (1962)	Rs. 3,000	Non-exclusive	1963	4,08,199 nos. 4,96,800
	Adept Laboratories, Poona (1963)	-do-	—		12,85,186 nos. 16,02,100

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
94. Transistorised power supply unit (CEERI)	Omega Electronics, Jaipur (1965)	Tempo Industrial Corporation, Bombay (1963)	Rs. 3,000 Non-exclusive	1967	6,000 nos.	25,000	8,000 nos.	33,000
			Premium—Rs. 500 (cost of one unit) Royalty—2½% Exclusive		6 nos.	7,200	6 nos.	7,200
<b>Chemical &amp; Mechanical Equipment</b>								
95. Carbon monoxide detector tube, Pat. No. 78780 (CMRS)	Mine Safety Appliances Ltd., Calcutta	Premium—Rs. 6,000 Royalty—2½% Non-exclusive	1968	Trial production				
96. Moisture meter (CSIO)	Oriental Science Apparatus Workshop, Ambala Cantt. (1966)	Royalty—50/21% Collaborative Work	1966	225 nos.	4,15,000	250 nos.	4,55,000	
<b>Plant &amp; Machinery</b>								
97. Brick and block making machine, Pat. No. 55602 (CMRI)	J. K. Iron & Steel Co. Ltd., Kanpur (1958)	Premium—Rs. 5,000 Royalty—Nil Zonal (UP & MP)	1959	1 no.	1,250	47 nos.	47,750	
	Supercrafts Pvt. Ltd., Calcutta (1958)	Zonal (Orissa, Bihar, Bengal & Assam)	1959	nil	nil	46 nos.	55,200	
	Prem Enamel & Metal Factory, Delhi (1959)	Zonal (Punjab, Rajasthan, J&K and Delhi)	1960	nil	nil	31 nos.	28,100	
98. Bunching machine (CMERI)	Kumardhubi Works Ltd., dhubi (1966)	Engg. Kumar-	Premium—Rs. 20,000 Royalty—2% Exclusive	1966	1	—	—	—

99. Cable stranding machine annealer (CMERI)	McNally Bird Engg. Co., Calcutta (1966)	Premium—Rs. 20,000 Royalty—2% Exclusive	1967	Production of prototype started
100. Continuous resistance annealer (CMERI)	Promain Ltd., New Delhi (1967)	Premium—Rs. 5,000 Royalty—2% Exclusive	1 no.	37,000
101. Electronic timing device (CMERI)	Techno-India Ltd., New Delhi (1966)	Premium—Rs. 500 Royalty—2% Exclusive	n.a.	n.a.
102. Filter, development of (CMERI)	Fritz & Singh Pvt. Ltd., Calcutta (1966)	Premium—Nil Royalty—1½% Exclusive	n.a.	n.a.
103. Flake Ice Plant, Pat. No. 100831 (CMERI)	Kirloskar Pneumatic Co. Ltd., Poona-13 (1964)	Premium—Rs. 20,000 Royalty—2% Exclusive	1965	8,33,000
104. Flexible coupling (CMERI)	Neofabrico, (1966)	Premium—Rs. 500 Royalty—2% Exclusive	1967	15 nos.
105. General purpose twisting machine for loop cables (CMERI)	Promain Ltd., New Delhi (1967)	Premium—Rs. 20,000 Royalty—2% Exclusive	1967	6 nos.
106. Hydraulic dynamometer (CMERI)	Bhartiya Electric Steel Co. Ltd., (1967)	Premium—Rs. 5,000 Royalty—5% Exclusive	1967	2,10,000
107. Loop paper insulating machine (CMERI)	Kumardhubi Works Ltd., dhubi (1966)	Engg. Kumar-	Premium—Rs. 20,000 Royalty—2% Exclusive	1 no.
108. Porous rigid filters, Pat. No. 59608, 66966 (NCL)	JN Parshad Aggarwal (Ashim Filters), New Delhi (1965)	Aggarwal	Premium—Rs. 5,000 Royalty—1½% Exclusive	3,36,160
				1,843.4 metres
				2,715.7 metres
				4,79,873

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
109. Spooler—500 kg. (CMERI)	Promain Ltd., New Delhi (1967)	Premium—Rs. 8,000 Royalty 2% Exclusive	1967	2 nos.	90,000	2 nos.	90,000	90,000
110. Trunk paper insulating machine (CMERI)	Kumardhuli Engineering Works Ltd., Kumar-dhuli (1966)	Premium—Rs. 5,000 Royalty—2% Exclusive	1966	1	12,00,000 (including Bunching machine)	1	12,00,000 (including Bunching machine)	12,00,000
111. Water cooler (CMERI)	Century Refrigeration Co., Calcutta	Premium—Rs. 3,000 Royalty—2% Exclusive	1967	n.a.	n.a.	n.a.	n.a.	n.a.

n.a.—Processes reported in production by the Laboratories concerned. Actual production data not available.

TABLE 2—PROCESSES IN DEPARTMENTAL PRODUCTION

(As on 1st April, 1968)

Sl. No.	Process No.	Year of commence- ment of production	1967-68		Since commencement of production	
			Quantity	Value	Quantity	Value
(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>CHEMICALS</b>						
1.	Ammonium perchlorate (CECRI)	1962	120 kg.	924	1,284 kg.	9,986
2.	Barium chloride (CECRI)	1963	197 kg.	1,409	1,801 kg.	13,323
3.	Potassium perchlorate (CECRI)	1962	5,775 kg.	55,152	39,442 kg.	3,88,976
4.	Fine chemicals (NCL)	1963	—	—	2,07,511	6,94,055
5.	Lindane and insecticidal formulations (CFTRI)	1966	—	21,185	—	46,968
<b>PULP AND PAPER</b>						
6.	Hand-made paper (RRL-Hyderabad)	1963	—	44,198	—	2,27,682
<b>FOODS AND BEVERAGES</b>						
7.	Cottonseed flour (RRL, Hyderabad)	1965	81 tonnes	1,95,492	161 tonnes	3,82,220
8.	Drinking water, canned (CFTRI)	1966	4,000 cans	5,000	7,527 cans	9,409
9.	Egg powder (CFTRI)	1966	2,000 kg.	30,000	3,173 kg.	71,055
10.	Lactone (CFTRI)	1966	12,370 litres	6,185	22,588 litres	11,294

(1)	(2)	(3)	(4)	(5)	(6)	(7)
11. Multipurpose food (cfrti)	1966	31.2 tonnes	55,950	61.4 tonnes	1,06,165	
12. Ready mixes (cfrti)	1966	3,500 kg.	15,200	7,296 kg.	26,146	
<b>GLASS, CERAMICS AND REFRactories</b>						
13. Optical glass (cgcri)	1962	—	5,42,247	—	18,50,753	
14. Pyrometric cones, Standard (rri, Hyderabad)	1966	3,63,650 nos.	40,000	—	18,82,030 nos.	2,21,745
15. Special glass and ceramic articles:						
(a) Enamels and stains	1960	—	—	—	1,61,780	
(b) Refractories	1964	—	93,482	—	3,38,112	
(c) Electrodes for pH meters (cgcri)	1965	—	—	—	1,83,060	
<b>LEATHER AND AUXILIARIES</b>						
16. Leather auxiliaries:						
(i) Fat liquor	1956	22 tonnes	32.34 tonnes			
(ii) Belting cement	1958	2.13 "	4.29 ,			
(iii) Acryl binder	1963	1.4 "	29.98 ,			
(iv) Hide powder	1959	—	0.127 ,			
(v) Glazing lacquer	1964	0.455 "	1.67 ,			
(vi) Syntans	1964	—	6.81 ,			
(vii) Tannin extract	1964	—	23.3 ,			
(viii) Lacquer emulsion	1964	1.70 "	2.78 ,			
(ix) Chrome liquor	1967	13.0 "	13.0 ,			
(x) Shower proofing agent	1967	0.65 "	0.65 ,			
(xi) Bates	1967	2.05 "	2.05 ,			
(xii) Lacquer top	1967	0.20 "	0.20 ,			

## COAL AND CARBON PRODUCTS

17.	Activated carbon, Pat. No. 58007 (on behalf of NRDC of India) (RRL, Hyderabad)	1958	120 tonnes	2,74,550	790.8 tonnes	13,21,964
18.	Hard coke and by-products (CFRI)	1966	Coke—1,447.6 tonnes Tar—41.2 tonnes	1,38,685 10,117	9,625 tonnes 394 tonnes	4,99,717 50,122
19.	Kolsit and by-products (RRL, Hyderabad)	1953	—	7,34,200	—	56,70,974
20.	Soft coke and by-products (CFRI)	1961	Coke—1,383.4 tonnes Tar—228.2 tonnes	49,998 56,248	11,776 tonnes 1,566 tonnes	3,53,621 2,07,297

## METALS AND MINERALS

21.	Carbon-free ferro-alloys by aluminio thermic reaction, Pat. No. 65231 (NML)	1964	17.89 tonnes	43,465	24.22 tonnes	91,386
22.	Manganese metal from low grade manganese ore, electrolytic (NML)	1961	445 kg.	4,450	6,945 kg.	69,450

## ELECTRONIC COMPONENTS

23.	Ferrite rods (NPL)	1962	1,35,598 nos.	2,11,835	5,76,533 nos.	9,96,338
24.	Hard ferrites, Pat. No. 93725 (NPL)	1966	25,109 pcs.	12,810	60,638 pcs.	22,286
25.	I.F. Cores (NPL)	1963	7,28,774 nos.	76,100	25,37,157 nos.	2,21,637
26.	Piezoelectric bodies (NPL)	1966	—	9,582	—	13,227
27.	Television receivers and printed circuits (CEERI)	1967	—	90,000	—	1,20,000
28.	Timmer bases (NPL)	1967	3,86,374 nos.	9,335	13,51,486 nos.	36,224

(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>BUILDING MATERIAL</b>						
29.	Lime reactive surkhi, Pat. No. 90470 (CRRI)	1962	51.7 tonnes	4,816	413.4 tonnes	35,064
30.	Reactive surkhi, Pat. No. 93726 (CRRI)	1962	330.1 tonnes	25,880	1,855.6 tonnes	1,30,520
<b>INSTRUMENTS AND EQUIPMENT</b>						
31.	Mineral prospecting and ground water survey instruments :	1965				
	(i) D.C. resistivity meter		42,000			
	(ii) Proton precision magnetometer		40,000			
	(iii) Electro-magnetic prospecting unit					
	(iv) Shallow refraction seismic timer (NGRI)					
			6,000			
32.	Optical Components :	1966				
	(i) Huygenian eye-pieces					
	(ii) Episcope objective					
	(iii) Diascope objective					
	(iv) Ramsden eye-pieces 1OX					
	(v) Episcope mirrors					
	(vi) Double demonstration eye-piece system					
	(Project sponsored by Laboratory Equipment Traders, Ambala Cantt.) (CSIO)					
33.	Transducers and associated equipment (NAL)	1966	190 nos.	1,16,400	218 nos.	1,51,400

TABLE 3—OTHER PROCESSES LICENSED

(As on 1st April, 1968)

Sl. No.	Process	Party/Year of release	Premium (Rs.)	Royalty	Nature of Licence
(1)	(2)	(3)	(4)	(5)	(6)
<b>CHEMICALS</b>					
1.	Acetanilide (NCL)	R. L. Dalal & Co., Bombay (1966)	—	—	Exclusive for project eng.ingineering
		Hindustan Organic Chemicals Ltd., Rasayani (through RLDC)	75,000	1%	Non-exclusive
2.	Bacterial diastase for desizing, Pat. No. 66096 (NCL)	Chemaux Pvt. Ltd., Bombay (1959)	75,000	6½%	Exclusive
3.	Barium potassium chromate, Pat. No. 78418 (RRL, Hyderabad)	Sudarshan Chemical Industries Pvt. Ltd., Poona (1966)	5,000	Rs. 75 per tonne	Exclusive
4.	Benzaldehyde, Pat. No. 62379 and 62426 (CECRI)	Chemicals & Aromatics, Bombay (1967)	5,000	2½%	Non-exclusive
5.	Benzidine, Pat. No. 68869 (CECRI)	Kabbur Dyes (P) Ltd., Bombay (1966) Hindustan Intermediates, Ahmedabad (1967) Winsol Chemical Industries, Bombay (1967)	10,000 10,000	5% 5%	Non-exclusive Non-exclusive
6.	Benzyl alcohol, benzyl acetate, benzoic acid, benzyl benzoate, benzaldehyde, phenyl acetic acid and phenyl acetamide, Pat. No. 96420, 96421 and 96422 (RRL, Hyderabad)	Orgaroma India Pvt. Ltd., Hyderabad (1966)	70,000	1½%	Turnkey job

(1)	(2)	(3)	(4)	(5)	(6)
7. Beta-ionone, Pat. No. 77225 (NCL)	S. H. Kelkar & Co., Bombay (1961)	—	—	2½%	Non-exclusive
8. Calcium gluconate, Pat. No. 51189 (CECRI)	Gandhishah Chemidyes Industries, Ahmedabad (1963)	4,000	—	2½%	Non-exclusive
	Gujarat Pharmaceutical & Chemical Works, Ahmedabad (1966)	4,000	—	2½%	Non-exclusive
	Shetty Pharmaceuticals and Biologicals Ltd., Bombay (1967)	4,000	—	2½%	Non-exclusive
	Electrochemical Manufacturing Co., Trichur (1967)	4,000	—	2½%	Non-exclusive
9. Ethyl aceto-acetate (NCL)	Indian Organic Chemicals Ltd., Bombay (1963)	—	—	2½%	Non-exclusive
10. Fluorescent penetrant (CMERI)	Pioneer Equipment Co. Pvt. Ltd., Calcutta (1967)	—	—	2%	Exclusive
11. Hydrazine sulphate, Pat. No. 71321 (RRL, Hyderabad)	Essential Chemicals, Bombay (1966)	(Project Report)	5,000	25 p per kg.	Non-exclusive
12. Lounginin, Pat. No. 60863, 63719 (RRL, Hyderabad)	Standard Products Manufacturing Co., Bombay (1964)	5,000 plus 10,000 engineering fee	—	2½%	Exclusive
13. Para-amino phenol and 2:4 diaminophenol, Pat. No. 53195, 60865, 71978 and 79212 (CECRI)	Central Laboratories, Nagpur (1961)	—	—	2½%	Non-exclusive
	Shetty Pharmaceuticals & Biologicals Ltd., Bombay (1966)	—	—	2½%	Non-exclusive
	Gujarat Pharmaceutical & Chemical Works, Ahmedabad (1966)	—	—	2½%	Non-exclusive
	Shri M. Srenarayanan, Anamalai (1966)	—	—	2½%	Non-exclusive

14.	Phthalates, dibutyl and dioctyl (NCL)	R. L. Dalal & Co., Bombay (1966)	—	—	Exclusive for project engineering
15.	Phthalates, diethyl and dimethyl (NCL)	Mysore Acetate & Chemicals Co. Ltd., Bangalore-2 (1967)	2,00,000	—	Non-exclusive
16.	Potassium iodate (CECRI)	Meena Chemicals, Salem (1967)	5,000	2½%	Non-exclusive
17.	Pressure sensitive transparent adhesive tape, Pat. No. 66803 and 67490 (NCL)	Anandilal Hemraj & Co., Bombay (1959)	10,000	7½%	Exclusive
18.	Salicylaldehyde, electrolytic preparation of, Pat. No. 52631 and 60864 (CECRI)	Gandhishah Chemidesies Industries, Ahmedabad (1963)	4,000	2½%	Non-exclusive
		Chemicals & Aromatics, Bombay (1967)	4,000	2½%	Non-exclusive
PLASTICS AND RESINS					
19.	Insoluble reaction products of polystyrenes for use as cation exchange material, Pat. No. 74356 (NCL)	Tulsi Industries, Poona (1966)	—	50%	Non-exclusive
SURFACE COATINGS					
20.	Boron free enamels, Pat. No. 49555 and 54394 (CGCRI)	Sur Enamels & Stamping Works Pvt. Ltd., Calcutta (1966)	5,000	Rs. 3,000 per year	Non-exclusive
21.	Chemically resistant covering material, Pat. No. 74451 (NCL)	Natson Manufacturing Co. Ltd., Bombay (1964)	2,000	4%	Exclusive
22.	Water and weather proof composition based on CNSL (CBRI)	Bonita India Ltd., New Delhi (1966)	2,500	2½% (Minimum Rs. 2,500 per year)	Exclusive
AGRO-CHEMICALS					
23.	Citicide, Pat. No. 52338 (RRL, Hyderabad)	S. H. Shelat & Sons, Madras (1967)	5,000	2½%	Non-exclusive
24.	Potassium schoenite (CSMCR)	Industrial Consulting Bureau, Bombay (1967)	10,000 per plant	2% (from sub-licence)	Exclusive for project engineering
		Tamilnad Marine Transport Co., Tuticorin (1968)	10,000	2%	Non-exclusive

(1)	(2)	(3)	(4)	(5)	(6)
<b>PULP AND PAPER</b>					
,	25. Filter paper (RRL, Hyderabad)	Western India Paper & Board Mills, Bombay (1967)	10,000	5%	Exclusive
<b>DRUGS AND MEDICINES</b>					
26.	Diethyl stilbestrol, Pat. No. 60826 and 65778 (NCL)	Gluconate Ltd., Calcutta (1965)	2,500	5%	Exclusive
27.	Vitamin 'C' (NCL)	Hindustan Antibiotics Ltd., Pimpri (1961)	—	1%	Exclusive
<b>FOODS AND BEVERAGES</b>					
28.	Fruit juice powder, Pat. No. 49590 (CFTRI)	Manubhai C. Dewan & Co., Navapur (1958)	10,000	3%	Non-exclusive
29.	Water soluble calcium caseinate, Pat. No. 79596 (CFTRI)	Geoffrey Manners & Co., Bombay (1963)	—	2%	Non-exclusive
		Sundaram Medical & General Stores, Madras (1963)	—	2%	Non-exclusive
		Polson Ltd., Bombay-10 (1967)	—	2%	Non-exclusive
<b>OILSEEDS AND OILS</b>					
30.	Dehydrated castor oil, Pat. No. 46457 and 55423 (RRL, Hyderabad)	Industries Dept., Govt. of Andhra Pradesh, Hyderabad (1965)	10,000	—	Turnkey job
<b>ESSENTIAL OILS</b>					
31.	Separation and isolation of aromatic prin- ciple from Moschatus seed, Pat. No. 72408 (NBG)	Prabir Chakravarti C/o Eunic Electric Enterprises, Calcutta (1967)	2,000	—	Non-exclusive

## CERAMICS, REFRactories AND CLAYS

32. Decolorisation of off-coloured clays, Maharaja Cossim Bazar China Clay Mines Pvt. Ltd., Calcutta (1965) Pat. No. 87428 (CGCRI) — Rs. 3,000/yr. for 10 yrs. and Rs. 5,000/yr. for 4 yrs. Non-exclusive

33. Light Kaolin BP (RRL, Hyderabad) Electro-Diesel Pvt. Ltd., Alleppy (1967) 3,000 2½% Exclusive

34. Wetground mica, Pat. No. 55454 Shri Jaswant Raj Mehta, New Delhi (1966) (CGCRI) 40,000 5% on sale, 3% on Non-exclusive export

**LEATHER AND AUXILIARIES**

35. Acid washing, scouring, bleaching, softening goat hair, wool buff and camel hair, Pat. No. 87434 (CLRI) South East Tanning Co., Madras-3 (1967) 5,000 2½% Non-exclusive

36. Processing of dry ready-to-wet sausage casings from cattle, goat, sheep, pig and other mammalian intestines, Pat. No. 90469 (CLRI) Biological Evans Pvt. Ltd., Hyderabad (1964) Dietrich Schnebel (India) Pvt. Ltd., Madras (1967) — 5% Non-exclusive

39 Standard Super Casings Co. Ltd., Calcutta (1964) — 5% Non-exclusive

**COAL AND CARBON PRODUCTS**

37. Active carbon from coal and lignite, Pat. No. 48385 and 61320 (CFRI) Joint Director (Chemicals), Chemical Testing & Analytical Laboratory, Madras-32 (1968) 5,000 2½% Non-exclusive

38. Active carbon from coconut shells (CFRI) Lakshmi Chemicals, Calicut-11 (1967) 2,000 2% Zonal for Kerala State

**METALS AND MINERALS**

39. Aluminium alloys containing silicon, modification of, Pat. No. 76415 (NML) Prof. Dr. Ing. A. Witmosar, Professor of Metallurgy, University of Aachan, West Germany (1966) — 33-1/3% on payment received from sub-licences

(1)	(2)	(3)	(4)	(5)	(6)
40.	Copper powder, electrolytic, Pat. No. 76997 (NML)	Indian Copper Corporation Ltd., Calcutta (1965)	5,000	2½%	Non-exclusive
41.	Electrical resistance alloys (NML)	Cable Works (I) Ltd. Calcutta (1966)	5,000	2½%	Non-exclusive
42.	Fluxes for submerged arc welding, Pat. No. 68171 (NML)	R. Sen & Co., Calcutta (1964)	7,500	2½%	Zonal (Eastern zone)
		Tapadia Engineers & Traders Pvt. Ltd., Tatamgar (1965)	7,500	2½%	Zonal (Central zones U.P. & M.P.)
43.	Misch metal, Pat. No. 96709 (CECRI)	Vishwanath Saraf, Calcutta (1966)	20,000	2½%	Exclusive
44.	Manganese metal, electrolytic, Pat. No. 49355 (NML)	Devidayal Electromet Ltd., Bombay (1962)	1,00,000	2½%	Non-exclusive
45.	Manganese dioxide, electrolytic, Pat. No. 47982 (NML)	R. Sen & Co. (Metal Division), Calcutta (1968) (only Patent No. 49355)	50,000	2½% (Upto 1800 tonnes) 1½% (over 1800 tonnes) 1% for export	Non-exclusive
46.	Manganese ore, utilisation of, Pat. No. 48499 (NML)				
47.	Soldering of magnesium alloys, Pat. No. 97004 (CECRI)	Regal Battery Corporation, Bombay (1967)	1,000	—	Non-exclusive
48.	Thermostatic bimetals (NML)	Cable Works (I) Ltd., Calcutta (1966)	5,000	2½%	Non-exclusive
<b>PETROLEUM AND PRODUCTS</b>					
49.	Reclamation of used lubricating oil				
	(i) 500 tons/annum	Ravi Enterprises, Vijayawada-2 (1967)	3,000	—	Non-exclusive
	(ii) 200 tons/annum	Bagla Machinery Corporation, Saharanpur (1968)	2,000	—	Non-exclusive
	(iii) 1000 litres/day	Deepe Oil Company, Calcutta (1968)	5,000	—	Non-exclusive

ELECTRONIC COMPONENTS AND EQUIPMENT

50. Ceramic magnets (NML)  
Ceramic Magnets & Products Pvt. Ltd.,  
Bombay (1965) 8,000 2½% Non-exclusive

Tapadia Engineers & Traders Pvt.  
Ltd., Tatanagar (1965) 8,000 2½% Non-exclusive

G. P. Tolani & Co., Bombay (1966) 8,000 2½% Non-exclusive

51. Digital frequency meter (CEERI)  
Oriental Science Apparatus Workshop,  
Ambala Cantt. (1965) 15,000 5% Non-exclusive

52. Electronic Comparator (CMERI)  
Westing House Saxby Farmer Pvt. Ltd.,  
Calcutta (1966) 5,000 5% Exclusive

53. Electronic Flash Tubes (CEERI)  
J. B. Advani Oerlikon Electrodes (P)  
Ltd., Bombay (1966) 3,000 — Non-exclusive

54. Microwave components (CEERI)  
Ajuna Electronics (P) Ltd., Hyderabad  
(1965) — 5% Non-exclusive

55. Moving Coil Microphone (CEERI)  
Bhatty Mercantile Corporation, Bombay  
(1966) 3,000 3% Non-exclusive

McKenzie Philip (India) Ltd., Delhi  
(1966) 3,000 3% Non-exclusive

56. Piezoelectric material, Pat. No. 103201  
(NPL) Piezoelectric Ceramics (India), N. Delhi  
(1966) 1,000 2½% Non-exclusive

57. Power supply for flash tube (CEERI)  
J. B. Advani Oerlikon Electrodes (P)  
Ltd., Bombay (1966) 3,000 — Non-exclusive

58. Television receiver (CEERI)  
J. K. Electronics, Kanpur (1966) 75,000 2% Non-exclusive

Telerad (P) Ltd., Bombay (1966) 75,000 2% Non-exclusive

59. Traffic control device, Pat. No. 90906  
(NPL) Control & Switchgear Co., New Delhi  
(1966) 1,000 4% Non-exclusive

Beegee Corp. Pvt. Ltd., Patiala (1967) 1,000 4% Non-exclusive

(1)	(2)	(3)	(4)	(5)	(6)
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#### BUILDINGS AND BUILDING MATERIALS

60. Bitumastic jointing composition, Pat. No. 54074 (CBRI)	Pat. Shalimar Tar Products, Calcutta (1964)	2,000	3%	Non-exclusive
	Roofrite Private Ltd., New Delhi (1964)	2,000	3%	Non-exclusive
	R. C. Abrol & Co., New Delhi (1964)	2,000	3%	Non-exclusive
	Aquasol Products, Ahmedabad (1966)	2,000	3%	Non-exclusive
61. Expansion joint filler from coconut pith, Pat. No. 87958 (CBRI)	Aquasol Products, Ahmedabad (1966)	500	1½%	Non-exclusive
62. Expansion joint filler from CNSL and coconut pith (CBRI)	R. C. Abrol & Co. (P) Ltd., New Delhi (1965)	1,000	1%	Non-exclusive (Two firms)
	Shri Mahalakshmi Enterprises, Gubbi (Mysore) (1967)	1,000	1%	-do-
63. Foamed concrete (CBRI)	R. C. Abrol & Co. (P) Ltd., New Delhi (1965)	2,000	1%	Exclusive
64. Laying foamed concrete on curved and sloping surfaces (CBRI)	Shalimar Tar Products, Calcutta (1967)	1,000	1%	Non-exclusive
65. Particle board from wood waste without binder, Pat. No. 101714 (RRL, Jorhat)	Tinsukia Development Corporation, Tinsukia (Assam) (1967)	5,000	2½%	Non-exclusive
66. Pulp cement corrugated sheets (RRL, J. M. Patel, Jorhat)	J. M. Patel, Bombay (1967)	5,000	2½%	Non-exclusive
	Sri Srinivas Cement Products, Kakinada (1968)	5,000	2½%	Non-exclusive

#### INSTRUMENTS AND EQUIPMENT

67. High voltage power supply (CSIO)	Oriental Science Apparatus Workshop, Ambala Cantt. (1967)
	—
	First five pieces—Nil Next 20 pieces— 2½%. Thereafter 5%

Exclusive for 3 years  
Non-exclusive for 7 years

68. Vapour phase chromatograph (NCL) Associated Instruments Manufacturers 15,000 5% Exclusive  
(I) Pvt. Ltd., New Delhi (1968)

**CELLS AND BATTERIES**

69. Cuprous chloride water activated batteries, Regal Battery Corporation, Bombay (1967) 4,000 2% Exclusive  
Pat. No. 106820 (CECRI)

70. Silver chloride water activated batteries, Regal Battery Corporation, Bombay (1967) 8,000 4% Exclusive  
Pat. No. 106325 (CECRI)

**PLANT AND MACHINERY**

71. Dial gauges (CMERI) Meters and Instruments Pvt. Ltd., 5,000 2% Exclusive  
Chandigarh (1966)

72. Electrodynamic balancing machine Industrial & Agricultural Engg. Co. 10,000 2% Exclusive  
(CMERI) Pvt. Ltd., Calcutta (1966)

73. Electronic ignition system (CMERI) Magneto Electric Control Pvt. Ltd., 2,500 Upto 5,000 units—3% Exclusive  
Calcutta (1968)  
Over 5,001 units—2%

74. Escalator (CMERI) Dynacraft Machine Co. Pvt. Ltd., 20,000 2% Exclusive  
Bombay, (1966)

75. Extruder line take-up stand, Capstan Brimco Plastic Machinery Corporation, 10,000 2% Exclusive  
and Supply Stand (CMERI) Bombay (1967)

76. Fine wire drawing machine (CMERI) Promain Ltd., New Delhi (1967) 20,000 (a) Annual produc-  
Westing House Saxby Farmer Pvt. 20,000 tion less than  
Ltd., Calcutta (1967) — 10-5%

77. Fluid coupling (CMERI) — (b) First 2 million  
rupees 2% — (c) 2 million to 5  
million rupees 1½% — (d) Over 5 million  
rupee 1%

(1)	(2)	(3)	(4)	(5)	(6)
78. Glass lining of mild steel vessels (RRL, Andhra Foundry & Machine Co. Ltd., Hyderabad)	30,000	12000/yr.	Exclusive		
79. High pressure hydraulic pump (CMERI) Vinkum Engineering Enterprises Pvt. Ltd., Jaipur (1968)	5,000 first design 2,500	2%	Exclusive		
80. High speed twisting machine (CMERI) Kumardhubi Engineering Works Ltd., Kumardhubi (1966)	20,000	—	Exclusive		
81. Infinitely variable speed gear box Promain Ltd., New Delhi (1968)	8,000 for first design 2,000 for subsequent design	2%	Exclusive		
82. 'Jawan' Scooter (CMERI) Escorts Ltd., New Delhi (1966)	—	1% on ex-factory sale price not ex- ceeding Rs. 15/- per scooter	Exclusive		
83. Low temperature carbonization practice as related to narrow continuous vertical retorts, Pat. No. 68680 (CFRI) Coke Oven Construction Co. Pvt. Ltd., Calcutta (1962)	65,000 10,000 each retort	5% 5%	Exclusive for Bihar & West Bengal Non-exclusive for rest of India		
84. Magnetic crack detector—portable Pioneer Equipment Co. Pvt. Ltd., Calcutta (1968)	5,000	2%	Sub-liscence	Exclusive	
85. Metering pump (CMERI) Khimjison, Bombay (1968)	1,000	2%	Exclusive		

S.No.	Description	Supplier	Year	Engines		Exclusive
				Frames	Engines	
36. Moped frames and engine (CMERI)	Sen & Pandit Pvt. Ltd., Calcutta	(1967)		Upto 25,000 20,000 20,001 to 40,000 Above 40,000	5.00 each 2.50 each 2.00 each	
				Upto 40,000 Above 40,000	2.50 each 2.00 each	
87. Orbital motion pump (CMERI)	Khimjison, Bombay	(1967)		1,000	2%	Exclusive
88. Pneumatic gauging equipment (CMERI)	Westing House Saxby Farmers Pvt. Ltd., Calcutta (1967)			5,000	2½%	Exclusive
89. Portable hardness tester (Rockwell) (CMERI)	Blue Star Engg. Co. Ltd., Bombay (1968)			5,000	2½%	Exclusive
90. Rotillor (CMERI)	Khandelwal Udyog Ltd., Bombay	(1967)		5,000	2%	Exclusive
91. Snubbers for BOBS wagon (CMERI)	Bhartiya Electric Steel Co. Ltd., Calcutta (1966)			1,000	2%	Exclusive
92. Spooler for intermediate wire drawing machine (CMERI)	Promain Ltd., New Delhi (1967)			8,000	2%	Exclusive
93. Steam brakes (CMERI)	Damodar Enterprises Ltd., Raniganj, (1968)			2,500	3%	Exclusive
94. Tractor 20 H.P. (CMERI)	Mining and Allied Machinery Corp. Ltd., Durgapur and Britannia Engineering Co., 24 Parganas (1967)			—	1%	—
95. Tube pumps (CMERI)	Khimjison, Bombay	(1967)		1,000	2%	Exclusive
96. Universal shearing-cum-punching machine (CMERI)	Apeejay Structural Ltd., Calcutta	(1966)		10,000	2%	Exclusive

TABLE 4 — PROCESSES GIVEN AS TECHNICAL ASSISTANCE

(As on 1st April, 1968)

Sl. No.	Process	Party/Year of release	Fee (Rs.)
(1)	(2)	(3)	(4)
<b>Chemicals</b>			
1.	Albumen flakes (CFTRI)	S. Narayanan, Bangalore (1967)*	2,500
2.	Agar agar from sea weeds (CSMCRI)	Cellulose Products of India, Ahmedabad (1965)	1,000
3.	Barium sulphate, X-ray grade (RRL, Hyderabad)	Basichem Industries, Bombay (1964)	1,000 (Sponsored)
4.	Cadmium sulphide orange, Pat. No. 71301 (RRL, Hyderabad)	Indo Commercial Co., Ferozabad (1957)*	1,000
5.	Calcium silicate (NCL)	Newkem Products Corporation, Bombay (1967)	11,036 (Sponsored)
6.	Calcium silicate, hydrated from lime and silica sol. (CSMCRI)	National Chemical Industries, New Delhi (1966) Anand Industrial Enterprise, New Delhi (1966) Hindustan Insecticides Ltd., Alwaye (1966)*	1,000 5,000 (Project Report) 5,000 (Project Report)
7.	Calcium silicate, hydrated from marine gypsum (CSMCRI)	Standard Chemicals, Bhavnagar (1963)*	1,000
8.	Cattle licks (CSMCRI)	Natural Salt Industries, Belgaum (1962)* Chemical Salt Producers, Bhavnagar (1962)	500 500
9.	Chloral hydrate (NCL)	Hindustan Insecticides Ltd., New Delhi (1963)*	15,320 (Sponsored)
10.	Cryolite, synthetic (CECRI)	Premier Fertilizers Ltd., Madras (1963) Adarsh Chemicals and Fertilizers Ltd., Udhna (1962) Aluminium Corporation of India, Calcutta (1963) The Fertilizer & Chemicals Travancore Ltd., Alwaye (1963) ChemaFume Fertilizers & Chemicals, Calcutta (1964)* J.G. Patel, Sambalpur (1963) The Phosphate Co. Ltd., Calcutta (1962)* East India Distilleries & Sugar Factory Ltd., Madras (1962) Jayshree Fertilizers & Chemicals, Calcutta (1964)	2,000 2,000 2,000 2,000 2,000 2,000 2,000 2,000 2,000 2,000
11.	Dihydroisojasmine and peach aldehyde (NCL)	S.H. Kelkar & Co., Bombay (1964)*	5,000

(1)	(2)	(3)	(4)
12.	Ethyl acetate (RRL, Hyderabad)	Biochemical & Synthetic Products Ltd., Hyderabad (1963) United Drugs & Pharmaceuticals, Hyderabad (1963)	1,000 10,000 (Project Report)
13.	Heat sealable coating composition	Chandmal Fakirchand Jain, Indore (1963)*	500
14.	Magnesium chloride from sea bittern (CSMCRI)	Bharat Salt & Industrial Works, Bhavnagar (1965)	500
15.	Magnesium trisilicate (CSMCRI)	Standard Chemicals, Bhavnagar (1964)*	1,000
16.	1-Menthol from dementholised peppermint oil (NCL)	Bhavana Chemicals, Bombay (1968)	10,600 (Sponsored)
17.	Meta-aminophenol (RRL, Hyderabad)	Biochemical and Synthetic Products Ltd., Hyderabad (1965)	3,000
18.	Phenyl acetic acid and phenyl acetamide, Pat. No. 71944 (RRL, Hyderabad)	Mintex Corporation, Bombay (1965)	10,000 (Project Report)
19.	Pyridine bases from aqueous solutions (NCL)	Rainbow Tex Dyes Corporation, Baroda (1967)	500 (Sponsored)
20.	Rubberised cork sheet (NCL)	Bharat Casement Pvt. Ltd., Baroda (1966)*	8,000
21.	Silica gel (NCL)	Minco Products, Madras (1962)*	3,000 (Sponsored)
22.	Silica, precipitated (CSMCRI)	Jayant Chemicals, Vertej (1965)*	1,000
23.	Table salt and dairy salt (CSMCRI)	Belapur Salt Works, Bombay (1959) United Salt & Industrial Works Ltd., Kandla (1960) Shamalsha Girdhari & Co., Bombay (1960) Glaydawyn & Co., Bombay (1962)	1,500 1,500 1,000 (Table salt only) 1,000 (Table salt only)
24.	Titanium tetra-chloride (NCL)	Travancore Titanium Products Ltd., Trivandrum (1967)	1,36,000 (Sponsored)
<b>Dyes and Intermediates</b>			
25.	Diethyl meta aminophenol (NCL)	Sahyadri Dyestuffs Co. Ltd., Poona (1966)	10,000 (Sponsored)
26.	Golden Yellow GK (NCL)	Amar Dye Chem. Ltd., Bombay (1966)	13,000 (Sponsored)
27.	Reactive dyes (NCL)	Amar Dyes Chem. Ltd., Bombay (1966)	10,000 (Sponsored)
28.	Tetrabromoindigo (NCL)	Shree Dyes Pvt. Ltd., Poona (1965)*	5,000 (Sponsored)
29.	Thiodiglycol (NCL)	Hico Products Pvt. Ltd., Bombay (1961)	3,000 (Sponsored)

(1)	(2)	(3)	(4)
<b>Surface Coatings</b>			
30.	Aluminium zinc oxide primers (RRL, Hyderabad)	Indian Aluminium Co., Calcutta (1967)*	Sponsored work
<b>Drugs and Pharmaceuticals</b>			
31.	Acriflavine (NCL)	Bhaidas Karsandas, Bombay (1966)*	10,000 (Sponsored)
32.	Berberine hydrochloride (NCL)	G. Vallabhdas & Co., Bombay (1965)*	10,000 (Sponsored)
33.	Diamino-diphenyl sulphone (Dapsone) (CDRI)	Gujarat Pharmaceutical & Chemical Works, Ahmedabad (1967)	3,000 (Non-exclusive)
34.	Calcium hypo-phosphite (NCL)	Chunilal Ootamchand & Co., Bombay (1967)*	8,000 (Sponsored)
35.	Opium alkaloid, Pat. No. 97190 (NCL)	Central Board of Revenues, Govt. of India (1966)	Terms under negotiation (Sponsored)
36.	Terpineol and Terpin hydrate from carene (RRL, Hyderabad)	Camphor and Allied Products Ltd., Bareilly (1966)	5,000 (Feasibility Report)
37.	Thiacetazone (CDRI)	Gujarat Pharmaceutical & Chemical Works, Ahmedabad (1966)*	3,000 Non-exclusive
<b>Food and Beverages</b>			
38.	Bovite (CFTRI)	F.K. Research Products, Mysore (1965)*	3,000
39.	Fruit bars (CFTRI)	Jadwet Agencies, Madras (1967)*	1,000
40.	Fruit Jam (Palani Panchamuruthum) (CFTRI)	Thiru Avinan Industries, Palani (1965)*	5,000 (Exclusive)
41.	Instant mixes, Vadai, Jammon and Jilebi (CFTRI)	Gits Products, Poona (1965)*	4,000
42.	Liquid guava and banana (CFTRI)	S.K. Kantawar, Mysore (1966) Ramakrishna Dairy, Bangalore (1966)	4,000 2,000 (Two products)
43.	Mango cereal flakes (CFTRI)	South India Research Institute Ltd., Vijayawada (1965)* Polsons Distillery, Chalakudy (1965)	4,000 4,000
44.	Mustard powder (CFTRI)	Delicio Enterprises, Madras (1965)	3,000
45.	Pansupari nector (CFTRI)	Kissan Products Pvt. Ltd., Bangalore (1965)* V. Teetharappan, Tirunelveli (1964) The Cold Storage & General Mills Pvt. Ltd., Gwalior (1964)	4,000 250 250
<b>Oilseeds and Oils</b>			
46.	Fatty acids from cotton-seed soap-stock (RRL, Hyderabad)	Nathmal Goenka, Okola (1965) Essar Chemicals, Dhulia (1965)	1,000 (Project Report) 1,000 (Project Report)

(1)	(2)	(3)	(4)
<b>Clays</b>			
47.	Removal of gypsum from gypsiferous clays (RRL, Hyderabad)	Ramesh Chandra S. Lahoti, Gulberga (1965)	3,000
<b>Coal</b>			
48.	Briquetting of Maharashtra coal fines (RRL, Hyderabad)	Director of Geology and Mining, Govt. of Maharashtra, Nagpur (1967)	15,000
49.	Low ash, low phosphorus coke from coals for ferro alloys manufacture, production of (CRRI)	Industrial Development Corporation Orissa Ltd., Bhubaneshwar (1963)	8,000
50.	Low temperature carbonisation of coal (RRL, Hyderabad)	The Singareni Collieries Co. Ltd., Kothagudem (1966)	25,000 (Feasibility Report) 2,50,000 (Project Report)
		Government of Maharashtra (1967)	25,000 (Feasibility Report) 2,50,000 (Project Report)
<b>Metals and Minerals</b>			
51.	Copper plating of cinema arc carbon electrodes (CECRI)	Electro-carbons, Khanpur, Belgaun (1967)	550
52.	Copper powder suitable for organic reaction (CECRI)	Arlabs Ltd., Bombay (1959)*  S.G. Thatte, Bombay (1961)* Associated Chemical Industries, Ahmedabad (1961) The Narendra Silk Mills, Bombay (1961) J.B. Khandalgaonkar, Bombay (1961) Quality Electrometallising Industries, Bombay (1961) Assam Carbon Products, Gauhati (1961)	100  100 100 100 100 100
53.	Iron powder, electrolytic preparation of (CECRI)	Associated Chemical Industries, Ahmedabad (1960)  The Narendra Silk Mills, Bombay (1960) J.B. Khandalgaonkar, Bombay (1960) S. Arasakesari, Madurai (1960) Quality Electrometallising Industries, Bombay (1960) S. G. Thatte, Bombay (1960) Electric Control Gear Pvt. Ltd., Ahmedabad (1960)	100  100 100 100 100
54.	Lead powder, electrolytic preparation of (CECRI)	S.R. Mohanram, Ernakulam (1960)  Battery Charging Station, Guntur (1960)	100  100

(1)	(2)	(3)	(4)
	Electric Control Gear Pvt. Ltd., Ahmedabad (1960)		100
	Spark Battery Corp., Bombay (1960)		100
	A s s a m Carbon Products, Gauhati (1960)		100
55.	Tin, electrolytic refining of scrap reclaimed tin (CECRI)	Detinners Pvt. Ltd., Bombay (1964)	5,000
56.	Zinc powder, electrolytic preparation of (CECRI)	Soorya Chemical Works, Madurai (1960)	100
		Electric Control Gear Pvt. Ltd., Ahmedabad (1960)	100
		The Narendra Silk Mills, Bombay (1960)	100
		G.V. Ramaswami, Madras (1960)	100
		Quality Electro-metallising Industries, Bombay (1960)	100
57.	Welding of iridium balls to stainless steel nibs (CECRI)	Kandaswamy Nib Works, Sathur (1967)	500
<b>Petroleum and Products</b>			
58.	Reclamation of used lubricating oils (IIP)	Twilit Corporation, Bombay (1965)	35,000
<b>Public Health Engineering</b>			
59.	Treatment and disposal of synthetic drug waste (CPHERI)	Indian Drugs and Pharmaceuticals Ltd., Hyderabad (1966)*	81,000 (Sponsored)
60.	Treatment of photofilm waste (CPHERI)	Hindustan Photo Film Mfg. Co. Ltd., Ootacamund (1966)*	Cost of Chemicals (Sponsored)
<b>Instruments</b>			
61.	Box camera objective (CSIO)	Small Industries Service Institute, New Delhi (1965)	50
62.	Diascope objective (CSIO)	Purban Pvt. Ltd., Calcutta (1965)*	50
		A m b a l a Instruments Co., Ambala (1966)*	50
		Vedsons and Co., Delhi-6 (1965)	50
		Harvin Optical Glass Industries, Hyderabad (1965)	50
		Oriental Science Apparatus Workshop, Ambala Cantt. (1965)	50
		Hindustan Opticals, Dehra Dun (1966)	50
		Hindustan Scientific Works, Ambala Cantt. (1967)	50
		General Radio Appliances Ltd., Bombay (1967)	50
		Oxford Optical and Scientific Works, Delhi (1967)	50

(1)	(2)	(3)	(4)
63. Episcope objective (csio)	Purban Pvt. Ltd., Calcutta, (1965)* Prince Optical Works, Delhi (1965) Oriental Science Apparatus Workshop, Ambala Cantt. (1965) Hargolal and Sons, Ambala Cantt. (1965) Small Industries Service Instt., New Delhi (1965) Jagat Singh & Sons, Ambala Cantt. (1966) Hindustan Opticals, Dehra Dun (1966) Oxford Optical and Scientific Works, Delhi (1967) Hindustan Scientific Works, Ambala Cantt. (1967)		50 50 50 50 50 50 50 50 50
64. Film strip projector, objective (csio)	A m b a l a Instruments Co., Ambala Cantt. (1965) Hindustan Scientific Works, Ambala Cantt. (1967)		50 50
65. Huygenian eyepieces (i) 8 and 12.5 x (ii) 5, 10 and 15 x (csio)	Laboratory Equipment Traders, Ambala Cantt. (1967) Unique Trading Corporation, Bombay (1967)		100 150
66. Level telescope objective, external focusing (csio)	Universal Optics, Roorkee (1965)* Harvin Optical Glass Industries, Hyderabad (1965) Allied Instruments Pvt. Ltd., Bombay (1965) Associated Instruments Manufacturers Pvt. Ltd., New Delhi (1965) Anand Optical Glass & Engineering Works, Roorkee (1966) Hindustan Opticals, Dehra Dun (1966) Pressure Cookers and Appliances Pvt. Ltd., Bombay (1966)		50 50 50 50 50 50 50
67. Level telescope objective, external focusing—alternate design (csio)	Mahavir Optical Works, Roorkee (1965) Harvin Optical Glass Industries, Hyderabad (1965) Small Industries Service Institute, New Delhi (1965) H i n d u s t a n Opticals, Dehra Dun (1966)		50 50 50 50
68. Level telescope objective, internal focusing (csio)	Mahavir Optical Works, Roorkee (1965) Associated Instruments Manufacturers Pvt. Ltd., New Delhi (1966)		50 50

(1)	(2)	(3)	(4)
	Harvin Optical Glass Industries, Hyderabad (1965)		50
	Anand Optical Glass & Engineering Works, Roorkee (1966)		50
	Hindustan Opticals, Dehra Dun (1966)		50
	Universal Optics, Roorkee (1966)		50
69. Microscope objective 10 x (CSIO)	Ultra Medical and Science Apparatus Works, Bombay (1965)		50
	Technical Instruments Manufacturers, Bombay (1965)		50
	Towa Optics Pvt. Ltd., Delhi (1965)		50
	CPN Industries, New Delhi (1965)		50
	Central Scientific Instruments Corporation, Agra (1965)		50
	Oriental Science Apparatus Workshops, Ambala Cantt. (1965)		50
	Small Industries Service Instt., New Delhi (1965)		50
	Hindustan Opticals, Dehra Dun (1966)		50
	Laboratory Equipment Traders, Ambala Cantt. (1966)		50
	Crystal Engineering Co., Rajkot (1967)		50
	Unique Trading Corporation, Bombay (1967)		50
70. Ramsden eyepiece 10 x (CSIO)	Unique Trading Corporation, Bombay (1967)		50
71. Two point controller (CSIO)	Instrumentation Ltd., Kota (1968)		3,000
72. Visual colorimeter (Dubesque type) (CSIO)	Oriental Science Apparatus Workshops, Ambala Cantt. (1966)*		250

#### Equipment and Appliances

73. Automobile lead acid storage batteries (CECRI)	Salooja Brothers, Delhi (1960)	100
	S.R. Mohanram, Ernakulam (1960)	100
	Alpha Battery Corporation, Calcutta (1960)	100
	National Battery Works, Karaikudi (1960)	100
	Vidyat Ishwar Niwas, Indore, (1960)	100
	P. Kishore & Co., Calcutta (1960)	100
74. Capacitors, electrolytic (CECRI)	Resa Radioa, Madras (1964)	2,500

(1)	(2)	(3)	(4)
75.	Group hearing aids (NPL)	Parco, New Delhi (1960)*	5,000
76.	R.F. tuner for automobile radio receiver (CEERI)	Semi-conductors Ltd., Poona (1967)	4,000
77.	Stripping column for hydro-quinone—only design provided (RRL, Hyderabad)	Satyadev Chemicals Pvt. Ltd., Baroda (1966)*	5,000
78.	Transistor circuit testing thermos-tat (CEERI)	Semi-conductors Ltd., Poona (1967)	850
79.	Twin basket centrifuge, design of (CSMCRI)	Excel Industries, Bombay (1967)	500
80.	Washery plant for salt (CSMCRI)	J a y s h r e e Chemicals Ltd., Chatrapur (Ganjam) (1966)	1,000

\*Processes parties reported to have gone into production

**TABLE 5—PROCESSES RELEASED FREE OF CHARGE**

**A. PROCESSES ADOPTED FOR COMMERCIAL PRODUCTION**

Sl. No.	Process	Name of the party
(1)	(2)	(3)
<b>Chemicals</b>		
1.	Free flowing table salt, dairy salt and cattle licks (CSMCRI)	Hindustan Salt Works Ltd., Sambhar Lake
2.	Magnetic fluid for crack detection (NPL)	Asia Engineering Works, Gurgaon
3.	Plaster of Paris (surgical grade) from locally available gypsum (RRL, Jammu)	Drug Research Laboratory, Jammu
<b>Surface Coatings</b>		
4.	Opacified enamels from titanium (RRL, Hyderabad)	Deccan Porcelain & Potteries Ltd., Hyderabad
<b>Drugs and Pharmaceuticals</b>		
5.	Hyoscyamine from Physochlaine praelata (RRL, Jammu)	Drug Research Laboratory, Jammu
6.	Peptone and meat extract (CDRI)	Nath Laboratories, Hyderabad Biochemicals and Synthetic Products Ltd., Hyderabad
7.	Rutin from Fagopyrum esculentum leaves (RRL, Jammu)	Drug Research Laboratory, Jammu
<b>Food and Beverages</b>		
8.	Groundnut flour, edible quality (CFTRI)	Peanut Products Pvt. Ltd., Madras Rangavilas Oils Mills, Coimbatore
9.	Multipurpose food (CFTRI)	Chandra Corporation, Coimbatore
10.	Nutro biscuits (CFTRI)	Britania Biscuit Co., Calcutta
<b>Pulp and Paper</b>		
11.	Pulping of security press cuttings (RRL, Jorhat)	Vidarbha Paper Mills Ltd., Kanha
<b>Leather and Auxiliaries</b>		
12.	Fat liquoring and finishing recipe for zug grain leather (CLRI)	East India Chrome Tannery Ltd., Calcutta
13.	Full chrome cow hide, processing to match imported specimen quality (CLRI)	East India Chrome Tannery Ltd., Calcutta
14.	Full chrome and chrome retan upper leather (CLRI)	J. Sert, Calcutta
15.	Shoe upper leather, employing indigenous materials, modified process (CLRI)	K. Jaman, Calcutta
16.	Wet blue goat skin from w/s goat skins and wet blue hide from w/s cow hides for export (CLRI)	East India Chrome Tannery Ltd., Calcutta
<b>Glass and Refractories</b>		
17.	Combustion boats (CGCRI)	Kumar Manufacturing Co., Howrah
18.	Selenium free red glass bangles (CGCRI)	Bangle Industry in Ferozabad

**Metals**

19. Coinage alloy (NML) Government of India Mint, Bombay

**Buildings**

20. Cellular units for roofs (CBRI) Bengal Engineering Group, Roorkee  
 21. Precast lintels (CBRI) CPWD, Central Division (South), Madras  
 22. RCC doors and window frames (CBRI) G.E. (MES), Roorkee

**Equipments**

23. Equipment for Indian preserve (CFTRI) Hari Narain Gopinath, Delhi

**B. PROCESSES RELEASED FREE OF CHARGE DURING 1967-68****Chemicals**

1. Plaster of Paris bandage (CSMCRI) Technical details provided to several parties

**Surface Coatings**

2. Zircon opacifier (CGCRI) Sodepur Potteries, Sodepur, 24-Parganas

**Leather and Auxiliaries**

3. Bag tanned sole leather, improved method of (CLRI) Hide Tanning Industrial Cooperative Society Ltd., P.O. Pulbazar, Dt. Darjeeling

A. Rahman, Bhagalpur

4. Bag tanned sole leather from buffalo hides, improved method of (CLRI) Balliguda Leather Cooperative Industrial Society Ltd., P.O. Balliguda

5. Chamois leather from rejected limed and pickled goat skin (CLRI) Century Tannery, Calcutta

6. Coloured finishing of country tanned leather and Jawasee, improved process (CLRI) Idar Tanners Cooperative Society Ltd., Idar

7. Coloured kattai (CLRI) Central Model Tannery, Rajkot

8. E.I. Kips using indigenously available tanning material (CLRI) Surat Jilla Khadi Gramodyog Sahkari Sangh, Bardoli

Udyog Mandir Tannery, Junagarh

Bimal Leather Industries, Samiyala, Dt. Baroda

9. Football leather, vegetable tanned (CLRI) Bihar Khadi Gramodyog Sangh Training-cum-production centre, P.O. Saranpur

10. Full chrome and chrome retan calf leather (CLRI) Jubilee Tannery, Calcutta

Bihta Charma Sahayag Samiti Ltd., Bihta

Peoples Tannery, Calcutta

11. Full chrome and chrome retan upper leather (CLRI) South East Tanneries (P) Ltd., Calcutta

Century Tannery, Calcutta

Bihta Tannery, P.O. Bihta

(1)	(2)	(3)
12. Hair-on tanning (CLRI)		Abdul Wahid Tannery, Nasirabad
13. Kattai leather, manufacture of (CLRI)		Hasan Noor Mohd. Tannery, Nasirabad
14. Lining leather from wet salted cow hide (CLRI)		Abdul Wahid Tannery, Nasirabad
15. Lizard skin, tanning and finishing of (CLRI)		Rural Industries Project, Chuni
16. Pickled goat skin for export (CLRI)		Abdul Wahid Tannery, Nasirabad
17. Rapid floatless tannage of E.I. kid skins (CLRI)		Hasan Noor Mohd. Tannery, Nasirabad
18. Rapid tan sole leather and Bunwar leather (CLRI)		Associated Exporters Corp., Calcutta
19. Rapid tanning of sheep skin (CLRI)		East India Chrome Tannery, Calcutta
20. Rapid tanning of E.I. skins (CLRI)		Central Model Tannery, Rajkot
21. Retanning and resin finishing of upper leather from blue chrome cow (CLRI)		Mitter Tannery, Calcutta
22. Roller leather for textile aprons (CLRI)		Sovalal Ramdayal Tannery, Nasirabad
23. Sambhar skins, tanning and finishing of (CLRI)		Girdharilal Bhagirath Tannery, Nasirabad
24. Sole leather, quick tanning, using pit and drum (CLRI)		Fakir Chand Tannery, Nasirabad
25. Sole leather, retanning bag tanned (CLRI)		Abdul Wahid Tannery, Nasirabad
26. Sole leather manufacture (CLRI)		Bimal Leather Industries, Samiyala, Dt. Baroda
27. Sole leather by rapid pit tanning process (CLRI)		CS Liu, Calcutta
28. Suitcase leather from cow hides (CLRI)		Jubilee Tannery, Calcutta
29. Vegetable tanning of Dhamin skin for export (CLRI)		Abdul Aziz Tannery, Nasirabad
30. White chrome lining leather from wet salted sheep skin (CLRI)		Bihar Khadi Gramodyog Sangh Training-cum-Production Centre, P.O. Saranpur
31. Zug grain upper leather (CLRI)		Bihar Khadi Gramodyog Sangh Training-cum-Production Centre, P.O. Saranpur
		Hemtabad Tanning Cooperative Society Ltd., Hemtabad
		Rural Industries Project, Chuni
		S. A. Rahim, Nasirabad
		Unique Tannery, Calcutta
		Bihta Charma Sahayog Samiti Ltd., Bihta
		Ideal Tannery, Calcutta
		Rural Industries Project, Chuni
		Century Tannery, Calcutta
		B. Khan, Calcutta

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**TABLE 6—PROCESSES AVAILABLE FOR EXPLOITATION**

(As on 1st April, 1968)

[The processes released on non-exclusive basis or as technical aid (Tables 1 to 4) may also be available for exploitation in many cases. The Council does not make any claim regarding the commercial viability or economic feasibility of the processes]

**CHEMICAL PRODUCTS****Dyes and Intermediates**

1. Aniline (NCL)
2. BON acid (NCL)
3. Dimethyl aniline (NCL)
4. 4-Hydroxy carbostyrls (NCL)
5. Metanillic acid (RRL, Hyderabad)
6. Mono ethyl aniline (NCL)

**Drugs and Pharmaceuticals**

7. Amphetamine (CDRI)
8. Caffeine from tea waste (RRL, Jorhat)\*
9. Cholic and dehydrocholic acid (CDRI)
10. 5, 7-dichloro 8-hydroxy quinoline (CDRI)
11. Dithranol (NCL)
12. dl-menthol from citronellal (NCL)
13. Furacin (CDRI)
14. Furazolidone (CDRI)
15. Hesperidine (CDRI)
16. Iodoform (CECRI)\*
17. Lanolin from wool grease (CDRI)
18. Lyophilysed snake venom (RRL, Hyderabad)
19. Nitrofurantoin (CDRI)
20. Phenacetin from p-phenetidine (NCL)
21. Plasma fractionation, process for (CDRI)
22. Procaine (CDRI)
23. Psoralen (CDRI)
24. Sorbitol (NCL)
25. Tocopherols from rice bran (CDRI)
26. Tolazoline hydrochloride (CDRI)

**Biochemical Products**

27. Fungal diastase (CFTRI)
28. Pectolytic enzyme for clarification of fruit juices (CFTRI)

**Perfumery and Essential Oils**

29. Cardamom oil (CFTRI)\*
30. Civetone (NCL)

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- 31. Costus root oil (NCL)
- 32. Dihydroambrettolide and isoambrettolide (NCL)\*
- 33. Dihydrocivetone (NCL)
- 34. Exaltolide (NCL)
- 35. Exaltone (NCL)
- 36. Neo lavandulol (NCL)

#### **Agro-Chemicals (Fertilizers, Insecticides and Storage)**

- 37. Ballooning technique for disinfestation of coffee seeds (CFTRI)
- 38. Cereal fumigation technique (CFTRI)
- 39. Durobase formulations (CFTRI)\*
- 40. Durofume process (CFTRI)
- 41. Household insecticidal formulation for spraying (CFTRI)
- 42. Infra-red heat disinfestation of food products (CFTRI)
- 43. Insecticidal clays (CFTRI)
- 44. Minifume tablets for home scale storage of grains (CFTRI)
- 45. Mosquito repellent spray and cream (CFTRI)
- 46. Phenoxy acetic acid (NCL)\*
- 47. Potassium chloride as by-product of salt petre industry (CSMCRI)
- 48. p-Nitrophenol (NCL)
- 49. Preharvest prophylactic treatment with malathion (CFTRI)
- 50. Syngenite from mixed salt (CSMCRI)
- 51. Tricalcium phosphate as an insecticide (CFTRI)

#### **Resins, Adhesives and Waterproofing Agents**

- 52. Anion exchange resins from tar acids, phenols, etc. (CFRI)
- 53. Coating for oil filter paper (NCL)
- 54. Isocyanate based adhesive (NCL)
- 55. Sealants for canvas water bags (NCL)
- 56. Staple pin adhesive (NCL)
- 57. Styrenated alkyds (NCL)
- 58. Styrene DVB base anion exchange resin (NCL)\*
- 59. Type-writer rollers (NCL)

#### **Surface Coatings**

- 60. Anti-corrosive paint for ship bottom (RRL, Hyderabad)
- 61. Cast iron enamels, ordinary and corrosion resistant (CGCRI)
- 62. Plastic masonry paint (CBRI)\*
- 63. Zircon opacifier (CGCRI)

#### **Other Industrial Chemicals**

- 64. Alginic acid and sodium alginate (CSMCRI)
- 65. Aluminium calcium silicate (CSMCRI)

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- 66. Aminoguanidine sulphate and bicarbonate (CECRI)
- 67. Ammonium perchlorate from sodium chlorate (CECRI)
- 68. Benzene, toluene and naphthalene, conversion of aromatic extracts into (IIP)
- 69. Benzyl alcohol (CECRI)
- 70. Benzyl cyanide (RRL, Hyderabad)\*
- 71. Bromine from bittern (CSMCRI)\*
- 72. Calcium carbonate, micron size from oyster shells (CSMCRI)\*
- 73. Chlorohexane from benzene (RRL, Hyderabad)
- 74. Common salt, high purity by solar evaporation of brine (CSMCRI)
- 75. 2-4-Dinitromonomethylaniline (NCL)
- 76. Di-o-tolylbiguanide (Saponax) (NCL)\*
- 77. Ethylene di-chloride (NCL)
- 78. Hexachloroethane (NCL)
- 79. Hexadecanol, evaporation suppression by (CPHERI)
- 80. Magnesium carbonate, heavy basic (CSMCRI)
- 81. Magnesium chloride from sea bittern (CSMCRI)
- 82. Naphthenic acid from oil refinery streams (IIP)
- 83. Para nitrobenzoic acid (CECRI)
- 84. Phthalic anhydride from neutral tar oil (CFRI)
- 85. p-Methane hydroperoxide (NCL)\*
- 86. Potash alum from mixed salt (CSMCRI)
- 87. Potassium chlorate from sodium chloride (CECRI)
- 88. Potassium ethyl xanthate (NCL)
- 89. Potassium perchlorate from sodium chlorate (CECRI)
- 90. Rubber reclaiming agent (NCL)\*
- 91. Silica gel, special grade, for fluorescent indicator analysis of hydrocarbons (IIP)
- 92. Sodium chlorate from sodium chloride (CECRI)
- 93. Sodium sulphate from khari salt (CSMCRI)
- 94. Sodium sulphate from sambhar bittern (CSMCRI)
- 95. Substitute for double boiled linseed oil (NCL)\*
- 96. Succinic acid (CECRI)\*
- 97. Whiting from calcite mineral (CSMCRI)
- 98. White cement and potassium salts from felspar (RRL, Hyderabad)
- 99. Zinc from viscose rayon waste, recovery of (CPHERI)

## FOODS AND BEVERAGES

### Food Products

- 100. Bal ahar (CFTRI)
- 101. Flavoured malt food (CFTRI)
- 102. Infant food based on vegetable proteins (CFTRI)
- 103. Macaroni like products (CFTRI)

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- 104. Paddy, parboiling of (CFTRI)
- 105. Paustic atta (CFTRI)
- 106. Protein hydrolysate (CFTRI)
- 107. Protein hydrolysate from oilcakes (CDRI)
- 108. Rice, curing of new rice (CFTRI)
- 109. Weaning foods based on vegetable proteins (CFTRI)\*

### **Fruits, Vegetables and Condiments**

- 110. Banana powder (CFTRI)
- 111. Cardamom, preservation of green colour (CFTRI)
- 112. Fruits and vegetables, wax emulsion treatment for extending storage life (CFTRI)
- 113. Fruit toffees (CFTRI)
- 114. Papain from papaya (CFTRI)
- 115. Pectin from papaya and other pectin rich materials (CFTRI)\*
- 116. Tamarind juice concentrate (CFTRI)
- 117. White pepper and pepper oil (CFTRI)

### **Fish, Meat and Poultry**

- 118. Egg coating oil to extend storage life (CFTRI)
- 119. Egg powder (CFTRI)
- 120. Salt curing of Mackrel (CFTRI)
- 121. Silk worm pupae meal (CFTRI)

### **Beverages**

- 122. Cherry coffee, monsooning of (CFTRI)
- 123. Lac-tone (CFTRI)
- 124. Malted beverages based on vegetable proteins (CFTRI)
- 125. New beverages based on vegetable proteins (CFTRI)

## **OILS, FATS AND WAXES**

### **Oils and Fats**

- 126. Separation of non-glyceride constituents and simultaneous purification of seed lipids (NBG)
- 127. Stearic acid and tristearin from castor oil (RRL, Hyderabad)
- 128. Trilaurin or lauric acid from the fruits of Cinnamomum cecidodaphne Meissn (NBG)

### **Waxes**

- 129. Sugarcane wax, modified (NCL)

## **PULP AND PAPER**

- 130. Dissolving grade pulp from bamboo (RRL, Jorhat)
- 131. Reclamation of old newspaper by deinking for production of newsprint (RRL, Jorhat)
- 132. Writing and printing papers from waste papers free from mechanical pulp by removal of ink particles (RRL, Jorhat)

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## LEATHER AND AUXILIARIES

133. Dialdehyde starch (CECRI)
134. Fat liquors—P.F. CC & CT (CLRI)
135. Modified man-grove extracts from mangrove bark and wood (CLRI)
136. Myrobalan tannin extract (CLRI)
137. Surgical sutures (CLRI)\*
138. Tannin extracts CH, CHMI & WM (CLRI)
139. Wax dispersion leather finishing (CLRI)
140. Zirconium salts out of zirconium sand (CLRI)\*

## GLASS, CERAMICS AND REFRactories

### Glass

141. Foam glass (CGCRI)\*

### Ceramic Products

142. Autoclave plaster of Paris (CGCRI)\*
143. Chemical porcelain (CGCRI)\*
144. Machinable ceramic bodies (NPL)
145. Porcelain insulator for spark plugs (CGCRI)

### Refractories

146. Chemically bonded metal-clad or unclad basic refractories, Pat. No. 65610 (NML)
147. Dolomite refractories, completely stabilised, Pat. No. 61981 (NML)
148. Fireclay refractories—improving quality of (CGCRI)
149. High alumina refractories (CGCRI)
150. Magnesite refractories, Pat. No. 83652 (NML)
151. Magnesium silicate refractories, Pat. No. 57884 (NML)
152. Mullite refractories from kyanite, Pat. No. 58553 (NML)
153. Refractory compositions containing non-refractory chrome ores and refractory products therefrom, Pat. No. 68174 (NML)

## PETROLEUM AND PRODUCTS

154. Hydraulic brake fluid (IIP)
155. Hydrogenation/hydro-desulphurization of kerosene and diesel oil (IIP)
156. Micro crystalline wax from sucker rod wax (RRL, Jorhat)
157. Superior grade kerosene and aviation turbine fuel (CFRI)
158. Town gas from naphtha (IIP)

## COAL AND CARBON PRODUCTS

### Coal and Fuels

159. Briquetting of coal fines (RRL, Hyderabad)
160. Coal floatation by use of grids, improved process of (CFRI)
161. Low temperature carbonisation of coal (RRL, Hyderabad)
162. Water resistant briquettes from lignite without binder (CFRI)

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## Industrial Carbon Products

163. Active carbons (RRL, Hyderabad)
164. Projector carbon (NPL)\*

## METALS AND MINERALS

165. Aluminising by cementation process (CMERI)
166. Aluminium, furnace and flux for dip brazing of aluminium (CMERI)
167. Aluminium soldering technique for manufacture of condensers, evaporators used in air conditioners (CMERI)
168. Barytes, beneficiation of off-coloured barytes (RRL, Hyderabad)
169. Detinning of tin scrap and recovery of tin metal (CECRI)\*
170. Graphite, beneficiation of naturally occurring graphite ore, Pat. No. 112475 (RRL, Bhubaneshwar)\*
171. Lead refining (CECRI)
172. Liquid gold (NML)
173. Metal powder by atomisation of molten metal (NML)\*
174. Sodium metal (CECRI)
175. Solder and flux for aluminium jointing (CECRI)
176. Tin, electrolytic refining of (CECRI)
177. Vanadium penta-oxide and ferro-vanadium from vanadium bearing titaniferous magnetites (NML)
178. Zinc powder (CECRI)

## Metal Protection

179. Anodic phosphating (CECRI)
180. Grease proof paper (RRL, Jorhat)
181. Inhibition of corrosion during removal of rust and scale by acid solution (CECRI)
182. Rust and scale removing jelly (CECRI)\*

## ELECTRONIC AND MICROWAVE COMPONENTS

183. Broad band ferrite resonance isolator for microwave application (NPL)
184. Carbon composition resistor (NPL)
185. Carbon track for potentiometer (NPL)
186. Electroformed waveguide components (NPL)\*
187. Hard ferrites (NCL)\*
188. Microwave components (NPL)\*
189. Microwave components (L-band circulator, X-band circulator, directional coupler and X-band isolator) (CEERI)
190. Non-conductors, metallisation of (CGCRI)\*
191. Piezoelectric transducers and filters (NPL)
192. Semi-conductor material, dicing of, Pat. No. 86639 (CEERI)
193. Soft ferrites (NCL)\*

## INSTRUMENTS, EQUIPMENT AND APPLIANCES

### **Electrical, Electronic and Radio Instruments and Equipment**

194. A. C. line voltage regulator-automatic motor controller (CMERI)
195. Code to decimal translator (NAL)\*
196. Condenser microphone and preamplifier (CEERI)
197. Conductivity bridge 521 L (csio)
198. Conductivity cells (csio)
199. D.C. amplifier (NAL)\*
200. D.C. amplifier for photoelectric devices (csio)
201. D.C. Chopper amplifier (CMERI)
202. Device for rapid classification of mica, micanite, laminated sheets, etc. (CGCRI)
203. Digital counter (CMERI)
204. Digital frequency meter (CMERI)
205. Edge illuminated display (NAL)\*
206. Electro-dynamic vibration pick-up (CMERI)
207. Electronic millivoltmeter (CMERI)
208. Electronic timer 405 L (csio)
209. EMF current converter 301 I (csio)
210. End-window radiation counter (csio)
211. F.E.T. Chopper amplifier (csio)
212. Flash gun tube, electronic (CEERI)
213. G.M. Counters (csio)
214. Linear displacement meter, 381 I (csio)
215. Linear displacement transducer 381 TI (csio)
216. Linear frequency to voltage converter (CMERI)
217. Linear variable differential transformer, displacement and pressure transducers and associated electronic amplifiers (NAL)\*
218. Load controller, electronic (CMERI)
219. Logic blocks (NAL)\*
220. Low level transistor amplifier 701 CT (csio)
221. Mixer pre-amplifier and power amplifier (CEERI)
222. Potentiometric strip chart recorder (NCL)\*
223. Preset counter (CMERI)
224. Preset counter 402 L (csio)
225. Radio receiver, low cost (CEERI)\*
226. Servo-operated pen recorder, transistorised (CEERI)
227. Servo motor (csio)
228. Shaft position digitizer (NAL)
229. Simultaneous inter-communication system (NPL)
230. Single and multi-channel strain indicator (NAL)\*

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- 231. Standard pulse generator/time marker 421L (csio)
- 232. Sound level meter (CEERI)
- 233. Tachometer, electronic (CMERI)
- 234. Torque motor model 321 I (csio)
- 235. Transistor radio receiver, table model (CEERI)
- 236. Vibration meter (NAL)
- 237. Vibration pick-up (NAL)
- 238. Voltage to frequency converter (CMERI)

### **Mechanical Instruments and Equipment**

- 239. Abrasive wear testing apparatus (CMERI)
- 240. Aluminium evaporators and condensers for refrigeration industry (CMERI)
- 241. Automatic apparatus for collection of pollen and spores (NBG)
- 242. Beam comparator (CMERI)
- 243. Bench micrometer (CMERI)
- 244. Dial cylinder gauge (CMERI)
- 245. Diaphragm compressor (CMERI)
- 246. Fatigue testing machine for Helical compression springs (CMERI)
- 247. Fatigue testing machine for wire rods (CMERI)
- 248. Fuel consumption time indicator (CMERI)
- 249. Gas mask conisters, revivification of (CFTRI)
- 250. Hand torch suitable for work on glass-blowing lathe (csio)
- 251. Humidifier (csio)
- 252. Insulated fish basket (CFTRI)
- 253. Magnetic load cell (CMERI)
- 254. Master torch (csio)
- 255. Metal detector (CMERI)
- 256. Micro-electrode puller (csio)
- 257. Microforge (csio)
- 258. Oil diffusion pumps (csio)
- 259. Radiators, evaporative cooling of I.C. engine radiators (CMERI)
- 260. Slide rule and allied products (RRL, Hyderabad)\*
- 261. Strain gauge accelerometer (CMERI)
- 262. Strain gauge load cell (CMERI)
- 263. Tachogenerator (CMERI)
- 264. Tachometer, single speed (csio)
- 265. Tension meter (CMERI)
- 266. Thread counter (csio)
- 267. Turret type noiseless burner (csio)

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### **Optical Instruments and Appliances**

- 268. Direct vision spectroscope (csio)
- 269. Fizean interferometer (csio)
- 270. Flame photometer (csio)
- 271. Interference viewer (csio)
- 272. Laser power supply (csio)
- 273. Optical designs for :—
  - (i) Telemicroscope objective EfI 75.00 mm
  - (ii) Astronomical telescope objective EfI 1143 f/15
  - (iii) Collimator objective
  - (iv) Spectrometer objective
  - (v) Corneal loupe magnification 3, 6, 10x
  - (vi) Thread counter magnifier
  - (vii) Hygenian eyepiece 4, 5, 6. 3, 8, 10, 12. 5, 15, 16x
  - (viii) Ramsden eyepiece 7, 10, 15x
  - (ix) Kellners' eyepiece 16x
  - (x) Widefield eyepiece 5x
  - (xi) Low power micro-objective 3x
  - (xii) Binoculars objective 6 x 30 (csio)
- 274. Photometric comparator (CMERI)
- 275. Ring spherometers (csio)
- 276. Spherometer, optical (csio)
- 277. Telescope testing attachments (csio)

### **Heat Storage and Temperature Measurement Appliances**

- 278. Differential thermometer 371 I (csio)
- 279. Domestic and industrial heaters running on L.P. or town gas (CMERI)
- 280. Heat storage and/or heating of fluids with special reference to solar energy utilisation (NPL)
- 281. Pyrometer, optical (csio)
- 282. Multipoint temperature indicator 361 I (csio)
- 283. Running motor winding temperature indicator (CMERI)
- 284. Solar water heater (CBRI)
- 285. Solid state proportional temperature controller (CMERI)
- 286. Temperature controller, electronic 601 S (csio)
- 287. Thermistors, high temperature (NPL)
- 288. Thermocouple amplifier (NAL)
- 289. Thermocouple and resistant thermometers temperature indicator (NAL)
- 290. Thermometers, manufacture and testing of (NPL)\*

### **Medical Instruments**

- 291. A.C. defibrillator 221 M (csio)
- 292. Blood drop chamber and counter 208 M (csio)
- 293. Cardiac pace maker 209 M (csio)
- 294. Cardioscope with monitor and alarm 210 M (csio)

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- 295. Corneal loupe employing Hastings triplet system (csio)
- 296. Ionic decalcifier 206 M (csio)
- 297. Low level pre-amplifier 204 M (csio)
- 298. Plane and concave mirror type retinoscope (csio)
- 299. Plane mirror retinoscope (csio)
- 300. Pulse monitor 241 M (csio)
- 301. Ramsden's eyepiece type corneal loupe (csio)
- 302. R.F. isolation unit 203 M-a (csio)
- 303. Stimulator, student 210 M (csio)
- 304. Stimulator 203 M (csio)
- 305. Stimulator, transistorised 231 M (csio)
- 306. Tele-thermometer 207 M (csio)

#### **Cells and Batteries**

- 307. Cadmium sulphide photoconductive cells (NCL)
- 308. Dry cells (CECRI)\*
- 309. Nickel cadmium batteries (CECRI)\*
- 310. Sac element laclanche type cell (CECRI)\*
- 311. Silver oxide, zinc batteries (CECRI)\*

#### **Other Instruments and Appliances**

- 312. Attachment of Deva lamp for burning inferior kerosene with better illumination (IIP)
- 313. Gas analysis apparatus (csio)
- 314. Test kit for the determination of excess acidity in compressor lubricants (CMERI)
- 315. Vacuum valve, Pat. No. 109488 (RRL, Bhubaneshwar)

#### **PLANTS AND MACHINERY**

##### **Machinery for Optical Glass Working**

- 316. Lens grinding and polishing machine, single spindle and motor driven (csio)
- 317. Lens grinding and polishing machine, four spindle and motor driven (csio)
- 318. Pedal polishing machine for lenses (csio)
- 319. 2-Spindle roughing machine for optical components (csio)
- 320. 4-Spindle roughing machine for optical components (csio)

#### **Others**

- 321. Brick making machine (CBRI)\*
- 322. Dryer for drying of ercanut (CFTRI)
- 323. Fish meal cooker, Pat. No. 109185 (RRL, Bhubaneshwar)
- 324. Fluid energy mill, Pat. No. 112576 (RRL, Bhubaneshwar)\*
- 325. Gobar gas plant (CPHERI)
- 326. Mechanical salt harvesters, design of (CSMCRI)\*
- 327. Vertical shaft kiln cement plant (RRL, Jorhat)\*
- 328. Wind mills (NAL)\*

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## BUILDINGS AND ROADS—MATERIAL AND TECHNIQUES

- 329. Aerated (cellular) concrete from lime and fly-ash (CBRI)
- 330. Antistripping agent for road binder (CRRI)
- 331. Artificial nodulised soil cement aggregate (RRL, Jorhat)
- 332. Asbestos cement products, utilisation of Indian asbestos of amphibole variety (CFRI)
- 333. Bituminous binder or aggregates having antistripping properties (CRRI)
- 334. Cement coconut pith as an insulating material (CBRI)\*
- 335. Engineering bricks/paving bricks/acid resistant bricks (CBRI)\*
- 336. Fire resistant building board (CBRI)
- 337. General purpose and heavy duty flooring tiles from magnesium oxy chloride cement (CBRI)\*
- 338. Gypsum plaster board (CBRI)
- 339. Jet oil spillage resistant joint sealing composition (CRRI)
- 340. Joint sealing compound or pitch mastic composition (CRRI)
- 341. Light constructional material such as hard board, laminates, blocks, etc. from industrial waste (CFRI)
- 342. Light weight aggregate from sintered fly-ash (CBRI)
- 343. Lime from sugar press mud (CBRI)
- 344. Single stack system of plumbing (CBRI)
- 345. Sorel cement tiles (CSMCRI)
- 346. Styrene pitch, treatment of (CRRI)

### **Building Aids**

- 347. Architectural sun control device (CBRI)
- 348. Archo solslider (CBRI)
- 349. Asbestos sprayer (CBRI)
- 350. Heat flow transducers (CBRI)
- 351. Load cell, Pat. No. 107058 (CBRI)
- 352. Masonry saw for insertion of damp proof course in existing walls (CBRI)
- 353. Modified earthing arrangement for electric installation in houses (CBRI)
- 354. Sand sampler, Pat. No. 106805 (CBRI)
- 355. Ultrasonic equipment for testing concrete and cement (CBRI)\*
- 356. Unit frame scaffolding (CBRI)
- 357. Volume change measuring apparatus, Pat. No. 109364 (CBRI)

## WATER PURIFICATION AND PUBLIC HEALTH ENGINEERING

- 358. Disinfection technique for small community water supplies (CPHERI)
- 359. Humidification—dehumidification and electrodialysis plants, design of (CSMCRI)
- 360. Rural latrines, night soil wheel barrows and other sanitary wares (CPHERI)
- 361. Sewage treatment and disposal by oxidation pond (CPHERI)
- 362. Solar still, design of (CSMCRI)

\*Processes under negotiation as on 1-4-1968

**TABLE 7—SPONSORED INDUSTRIAL RESEARCH SCHEMES**  
(1967-68)

**A. SCHEMES SPONSORED BY INDUSTRIES/USER ORGANISATIONS**  
(For development of processes or for solution of problems)

Sl. No.	Title of the Scheme	Sponsoring Authority	Terms
(1)	(2)	(3)	(4)
<b>CHEMICALS</b>			
<b>Dyes and Intermediates</b>			
1.	Alizarine (NCL)	Aniline Dyestuffs & Pharmaceuticals Ltd., Bombay	Rs. 9,100 (1 year)
2.	Anthraquinonoid intermediate and dyes (NCL)	Indian Dyestuffs Industries Pvt. Ltd., Kalyan, Bombay	Rs. 13,436 (1 year)
3.	Chlorinated copper phthalocyanines (NCL)*	Sudarshan Chemical Industries Pvt. Ltd., Bombay	Rs. 7,836 (1 year)
4.	Lac dye (NCL)	Indian Lac Cess Committee (ICAR), Ranchi	Rs. 10,200 (4 years 7 months)
<b>Drugs and Pharmaceuticals</b>			
5.	Calcium hypophosphite (NCL)*	Chunilal Ootamchand & Co., Bombay	Rs. 34,145 w.e.f. Jan 1965
6.	Carbimazole (NCL)	Indian Schering Co. Ltd., Bombay	Rs. 10,000 (1½ years)
7.	Emetine from ipecac roots (NCL)*	Aphali Pharmaceuticals Ltd., Ahmednagar	Rs. 9,036 (2 years)
8.	1-Menthol from dementholised peppermint oil (NCL)*	Bhavana Chemicals Ltd., Baroda	Rs. 18,600 (2 years)
9.	Migimide (NCL)	Indian Schering Co. Ltd., Bombay	Included in 6
10.	Radio opaque dyes like urografin and biligrafin (NCL)	Unichem Laboratories Ltd., Bombay	Rs. 11,036 (1 year)
11.	Screening of compounds for pharmacological activity (NCL)	Bristol Laboratories, Syracuse, New York	\$ 5000 (1 year)
12.	Sodium cyclamates (NCL)*	Aphali Pharmaceuticals Ltd., Ahmednagar	Rs. 9,036 (2 years)
13.	Sorbide nitrate (NCL)	Indian Schering Co. Ltd., Bombay	Included in 6
14.	Sulphacetamide and its sodium salt (NCL)	Indian Schering Co. Ltd., Bombay	Included in 6
15.	Stabilisation of vitamins in pharmaceutical preparations (CDRI)*	Pharma Products Pvt. Ltd., Thanjavur	Rs. 1,000
<b>Aromatic and Perfumery Chemicals</b>			
16.	B-phenethyl alcohol (NCL)	Sunanda Agarbatti, Mysore	Rs. 23,236 (1 year)
17.	Jasmine oil, extraction of (RRL, Hyderabad)	P. Chengal Reddy, Hyderabad	Rs. 1,000

(1)	(2)	(3)	(4)
18. Perfumery chemicals, manufacture of (RRL, Hyderabad)	Hindustan Lever Ltd., Bombay		Cost of raw material, special equipment & salaries in addition to lumpsum fee
19. Perfumery grade geraniol, citronellal and citronellol from Indian lemongrass oil (NCL)	Radhakishan Rajaram & Co., Bombay		Rs. 6,118 (6 months)
20. Utilisation of $\Delta$ carene (NCL)	Camphor and Allied Products Ltd., Bareilly		Rs. 11,000 (1 year)
21. Utilisation of longifolene (NCL)	Camphor and Allied Products Ltd., Bareilly		Rs. 11,000 (1 year)
22. Utilisation of terpene-G (NCL)*	Camphor and Allied Products Ltd., Bareilly		Rs. 10,000 (1 year)
<b>Resins</b>			
23. Pulverisable polymers from cashewnut shell liquids (RRL, Hyderabad)	Hylam Ltd., Hyderabad		Rs. 6,000 (per month)
<b>Pigments, Paints and Surface Coatings</b>			
24. Red oxide pigments (RRL, Hyderabad)	Timblo Industries Pvt. Ltd., Goa		Rs. 200 plus raw materials
25. Surface coatings (RRL, Hyderabad)	Indian Council of Agricultural Research, New Delhi		50% expenditure ICAR
<b>Pulp and Paper</b>			
26. Complete separation of silica from spent liquor in paper mills (RRL, Hyderabad)	Orient Paper Mills, Brajrajnagar, Orissa		Raw materials plus salary of research workers
27. Investigations on mixture of hard woods from Bastar forests for dissolving pulp (NCL)*	Pre-investment Survey of Forest Resources, Govt. of India, New Delhi		Rs. 9,000 (3 months)
28. Pulping of Kashmir soft woods (NCL)	J.K. Minerals Ltd., Srinagar		Rs. 37,980 (1 year)
29. Rayon grade pulp from some species of wood (NCL)*	Century Rayons, Bombay		Rs. 24,500 (1 year)
<b>Other Chemical Products</b>			
30. Acetaldehyde (RRL, Hyderabad)	Allied Resins and Chemicals Pvt. Ltd., Calcutta		Rs. 5,000
31. BD-Catalyst (NCL)	Synthetics and Chemicals (P) Ltd., Bombay		Rs. 13,154 (1 year)
32. Benzoic acid (NCL)*	Aniline Dyestuffs & Pharmaceuticals Ltd., Bombay		Rs. 6,236 (1½ years)
33. Calcium silicate (NCL)*	Newkem Products Corporation, Bombay		Rs. 11,036 (1 year)
34. Evaporation suppression studies in Rajasthan (Jawai Lake Dist. Pali) (CPHERI)	Chief Engineer, Irrigation, Rajasthan Government, Jaipur		TA/DA of staff and cost of chemicals
35. Industrial chemicals from diketene (NCL)	Aniline Dyestuffs & Pharmaceuticals Ltd., Bombay		Rs. 14,000 (1 year)

(1)	(2)	(3)	(4)
36. Nonyl phenol (NCL)*	Surfactants Pvt. Ltd., Bombay	Rs. 4,300 (1 year)	(1)
37. Pine tar, improvement in the process of manufacture (RRL, Hyderabad)	Rajendra Rosin & Turpentine Industries, Hoshiarpur	Rs. 5,000	
38. Potassium carbonate, manufacture of (CSMCRI)	Kumar Brothers, Secunderabad	Rs. 10,000	
39. Silicon carbide, suitability of silica sand for the manufacture of (RRL, Hyderabad)	Director of Geology and Mining, Govt. of Maharashtra, Nagpur	Rs. 5,000	
40. Titanium tetra-chloride from ilmenite (NCL)*	Travancore Titanium Products Ltd., Trivandrum	Rs. 1,36,000 (2½ years)	(2)
<b>FOODS AND BEVERAGES</b>			
41. Coffee Research Scheme (CFTRI)	Coffee Board, Bangalore	Rs. 30,000	
42. Cottonseed flour (RRL, Hyderabad)	Indian Council of Agricultural Research, New Delhi	50% expenditure ICAR	
43. Food Products Control Order Scheme—standardisation of food products (CFTRI)	AMA with the Govt. of India, Nagpur	Rs. 74,000	
44. Sesame seeds for making high protein food, processing of (RRL, Hyderabad)	Amrit Banaspati Co. Ltd., Ghaziabad	Rs. 1,000	
45. Tea Research Scheme (CFTRI)	Tea Board, Calcutta	n.a.	
<b>VEGETABLE OILSEEDS, OILS AND WAXES</b>			
46. Aflatoxin in groundnut and groundnut cake (RRL, Hyderabad)	Indian Council of Agricultural Research, New Delhi	50% expenditure ICAR	
47. Castor oil hydrogenation (RRL, Hyderabad)	Indian Council of Agricultural Research, New Delhi	50% expenditure ICAR	
48. Cottonseed oil refining (RRL, Hyderabad)	Indian Council of Agricultural Research, New Delhi	50% expenditure ICAR	
49. Fatty acids and fat splitting (RRL, Hyderabad)	Indian Council of Agricultural Research, New Delhi	50% expenditure ICAR	
50. Hard fat by hydrogenation of groundnut oil, development of (RRL, Hyderabad)	Corn Products (India) Pvt. Ltd., Bombay	Rs. 1,000	
51. Non-edible oils, utilisation of both fats and active constituents (NBG)	Non-edible Oil & Soap Industry, Khadi and Village Industries Commission, Bombay	Expenditure met by sponsor	
52. Oilseed milling (RRL, Hyderabad)	Indian Council of Agricultural Research, New Delhi	50% expenditure ICAR	
53. Rancidity and antioxidants (RRL, Hyderabad)	Indian Council of Agricultural Research, New Delhi	50% expenditure ICAR	
54. Sal seeds (Shorea robusta), processing of (RRL, Hyderabad)	Utkal Contractor & Joinery Pvt. Ltd., Sambalpur	Rs. 1,000	
55. Steroids and wax from sugar cane press mud (NCL)	Brihanmaharashtra Sugar Syndicate Ltd., Poona	Rs. 5,000 (1 year)	

### LEATHER AND AUXILIARIES

56. Factors responsible for the white spot defects in Indian sheep and goat skins (CLRI)	Indian Hides and Skins Improvement Society, Madras	Expenditure by sponsor	met
57. Factors responsible for yellow colouration of wool and means of eradicating the same (CLRI)	Indian Council of Agricultural Research, New Delhi	Expenditure by ICAR	met
58. Fat liquors and syntans, production of (CLRI)	National Research Development Corporation, New Delhi	Expenditure by sponsor	met
59. Shellac based resin finishes for leather and other sub-projects (CLRI)	Indian Lac Cess Committee (ICAR), Ranchi	Expenditure by sponsor	met
60. Tannin extract, preparation of (CLRI)	Amba Tannin and Pharmaceuticals, Kolhapur	Expenditure by sponsor	met
61. Training in leather goods and leather puppetry (CLRI)	Madras Natya Sangh, Madras	Expenditure by sponsor	met

### GLASS, REFRactories AND CLAYS

62. Activated earths (RRL, Hyderabad)	Indian Council of Agricultural Research, New Delhi	50% expenditure ICAR
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### MINING

63. Coir matting for use in mines, utilisation of (CMRS)	Coir Board of India, Ernakulam	Rs. 10,000
64. Operational research and work study of Kenda Seam (CMRS)	Parasea Colliery, P.O. Kajoragam, Dist. Burdwan	Rs. 3,000
65. Study of ropeway and sand gathering plant, Jamadoba, (CMRS)	Tata Iron & Steel Co., Jamadoba	Rs. 600

### COAL AND CARBON PRODUCTS

66. Acceptance tests of the Durgapur washery (CFRI)	The Durgapur Project Ltd., Calcutta	Rs. 27,500
67. Activated carbon, Hykol 'O' (RRL, Hyderabad)	National Research Development Corporation, New Delhi	Expenditure by sponsor
68. Activated carbon, Hykol 'X' (RRL, Hyderabad)	National Research Development Corporation, New Delhi	Expenditure by sponsor
69. Carbonisation tests on Ramgarh Block I (Top and Bottom Sec.) Coals from VII Seam Ramgarh Coalfield (CFRI)	National Coal Development Corporation, Ranchi	Test charges met by sponsor
70. Dense carbon aggregate as substitute of calcined anthracite coal (NML)*	India Carbon Ltd., Calcutta	Expenditure borne by sponsor
71. Field study of Kargali Seam at Kathara Colliery for drawing bulk samples for washability investigations (CFRI)	Bokaro Steel Ltd., Bokaro	Rs. 3,860
72. High temperature carbonisation tests of Ramgarh Block I Coals in blends with Dugda I and Dugda II schedule coals (CFRI)	National Coal Development Corporation, Ranchi	Rs. 25,000 (for three schemes)

(1)	(2)	(3)	(4)
73.	Hydraulic sand stowing scheme for Kargali Colliery (CFRI)	National Coal Development Corporation, Ranchi	Rs. 5,000
74.	Investigations on Kathara Slurry (CFRI)*	National Coal Development Corporation, Ranchi	Rs. 9,820
75.	Iso-ash maps for XVII Top and XVII Bottom seams occurring in Moonidih Block (CFRI)	National Coal Development Corporation, Ranchi	Under General Agreement
76.	Recovery of middlings and rejects obtainable from Kathara and Gidi Washery feed for detailed analysis (CFRI)*	National Coal Development Corporation, Ranchi	General Agreement on Washery Projects
77.	Washability investigation on coals (CFRI)	National Coal Development Corporation, Ranchi	Under General Agreement on Washery Project, consolidated fee Rs. 55,000

### METALS AND MINERALS

78.	Beneficiation of ferruginous and silicious bauxite samples (NML)*	Hindustan Aluminium Corporation Ltd., Renukoot	Expenditure met by sponsor
79.	Beneficiation of graphite (NML)	Govt. of Assam, Shillong	Expenditure met by sponsor
80.	Beneficiation of graphite sample (NML)	S. Lall & Co. Pvt. Ltd., Calcutta	Expenditure met by sponsor
81.	Beneficiation of graphite from Khamam District, A.P. (NML)	Indian Plumbogo Co., Bombay	Rs. 1,500
82.	Beneficiation of high silica magnesite from Kadakola Mines, Dodkanya, Mysore (NML)	Belpalar Refractories Ltd., Mysore	Expenditure met by sponsor
83.	Beneficiation of Kyanite from Rajkharswan Mines, Bihar (NML)*	Indian Copper Corporation Ltd., Ghatsila	Rs. 2,000
84.	Beneficiation of Kyanite and sillimanite for use in refractory purposes (NML)	Director, Geology and Mining, Govt. of Maharashtra, Nagpur	Expenditure met by sponsor
85.	Beneficiation of phosphate rock sample from Maton Block of Udaipur District (NML)	Geological Survey of India, Calcutta	Expenditure met by sponsor
86.	Beneficiation of Phosphorite from Mussoorie (NML)	Geological Survey of India, Calcutta	Rs. 1,500
87.	Beneficiation of Phosphorite bearing mineral (NML)	Director of Geology, Govt. of Rajasthan, Udaipur.	Rs. 1,500
88.	Beneficiation of quartz sillimanite schist from Sonapahar (NML)*	Director of Geology and Mining, Govt. of Assam, Shillong	Expenditure met by sponsor
89.	Beneficiation studies on an argillaceous limestone sample from Dungri limestone quarry (NML)	Orissa Mining Corporation, Dungri	Rs. 2,000
90.	Beneficiation studies with a low grade fluorspar from Ambadougar, Dist. Baroda and detailed proposals for setting up of a 500 tonnes/day beneficiation plant (NML)	Gujarat Mineral Development Corporation Ltd., Baroda	Expenditure met by sponsor

(1)	(2)	(3)	(4)
91.	Crushing and grinding characteristics of granite, black rock and ore pebbles for use as grinding media in pebble mills (NML)	Kolar Gold Field Undertaking, Nundydroog, Mysore State	Expenditure by sponsor met
92.	Crushing and screening of $\frac{1}{2}$ " fines from three iron ore samples from deposit No. 14 of Bailadila iron ore mines (NML)	National Mineral Development Corporation Ltd., Faridabad	Expenditure by sponsor met
93.	Crushing and wet screening tests with an iron ore sample from deposit No. 5 of Bailadila iron ore mines (NML)	National Mineral Development Corporation Ltd., Faridabad	Expenditure by sponsor met
94.	Investigation into the corrosion of reinforcement in RCBW and RCCB construction (CECRI)*	National Buildings Organisation, New Delhi	Rs. 72,818
95.	Nickel and apatite from copper ore, recovery of (NML)	Indian Copper Corporation, Ghatsila	Expenditure by sponsor met
96.	Pelletization and calcination of limeshells from Kerala (NML)	Travancore Electro-Chemical Industries, Chingavaram	Expenditure by sponsor met
97.	Pilot plant trials for production of magnesium metal using Salem magnesite (CECRI)*	Govt. of Madras, Madras	Rs. 3,07,825
98.	Possibility of lowering of phosphorus in three iron ore samples from M.P. (NML)*	M. P. Audyogic Vikas Nigam Ltd., Bhopal	Expenditure by sponsor met
99.	Ramming mixes, development of (NML)	New Standard Engineering Co. Ltd., Bombay-13	Expenditure by sponsor met
100.	Recovery of zinc from zinc dross (NML)	Post and Telegraph Workshop, Calcutta	Expenditure by sponsor met
101.	Reducibility of Dalli iron ore (NML)	Bhilai Steel Plant, Hindustan Steel Ltd., Ranchi	Rs. 60,000
102.	Research and experimentation in improved methods of silver plating of imitation and real jari (CECRI)	All India Handicrafts Board, Ministry of Commerce, New Delhi	Rs. 35,198
103.	Sintering and stabilisation of Nattam dolomite (NML)*	Neveli Salem Steel Project, Madras	Expenditure by sponsor met
104.	Sintering of iron ore fines (NML)	Mysore Iron & Steel Works Ltd., Bhadravati	Rs. 10,000
105.	Smelting of Deulgaon iron ore and Khurasipar iron ore containing high titania (NML)	Director of Geology and Mining, Govt. of Maharashtra, Nagpur	Expenditure by sponsor met
106.	Study of foundry shop at Tatas Central Workshop, Jamadoba (CMRS)	Tata Iron & Steel Co. Ltd., Jamadoba	Rs. 300
107.	Studies on Nandydroog gold ore with a view to improving gold recovery (NML)*	Kolar Gold Field Undertaking, Nandydroog, Mysore	Expenditure by sponsor met
108.	Suitability test on 12 manganese ore samples for manufacture of electrolytic manganese metal (NML)	Manganese Ore (I) Ltd., Nagpur	Expenditure by sponsor met

(1)	(2)	(3)	(4)
109.	Testing of Surajgarh iron ore for crushing characteristics, mineralogical compositions, decrepitation properties, etc. (NML)	Director of Geology and Mining, Govt. of Maharashtra, Nagpur	Rs. 4,000
<b>PETROLEUM AND PRODUCTS</b>			
110.	Commercial hexane at Koyali Refinery, manufacture of (IIP)	Indian Oil Corporation, H.O. New Delhi	Expenditure met by sponsor
111.	Feasibility of production of extender oil (IIP)	Synthetic and Chemicals Pvt. Ltd., Bareilly	Expenditure met by sponsor
112.	Forecast of petroleum products demand (IIP)	Ministry of Petroleum and Chemicals, New Delhi	Expenditure met by sponsor
113.	Gujarat Petro-chemical complex (IIP)	Oil and Natural Gas Commission, Dehradun	Expenditure met by sponsor
114.	Injection of fuel oil in blast furnaces (IIP)	Indian Oil Corporation, H.O. New Delhi	Expenditure met by sponsor
115.	Light diesel oil survey (IIP)	IOC through Ministry of Petroleum and Chemicals, New Delhi	Rs. 10,000
116.	Lube oil plant in Cochin (IIP)	Ministry of Petroleum and Chemicals, New Delhi	Expenditure met by sponsor
117.	Madras Refinery Project (IIP)	Ministry of Petroleum and Chemicals, New Delhi	Expenditure met by sponsor
118.	Mineral turpentine solvent survey (IIP)	Ministry of Petroleum and Chemicals, New Delhi	Rs. 15,000
119.	North West Refinery (IIP)	Ministry of Petroleum and Chemicals, New Delhi	Expenditure met by sponsor
120.	Past trends in the consumption of major POL products (IIP)	Ministry of Petroleum and Chemicals, New Delhi	Expenditure met by sponsor
121.	Reclamation of oil (IIP)	Delhi Transport Undertaking, Delhi	Reclamation fee borne by sponsor
122.	Selection of reforming catalyst (IIP)	Indian Oil Corporation, H.O. New Delhi	Expenditure met by sponsor
123.	Transformer oils in India, manufacture of (IIP)	Ministry of Petroleum & Chemicals, New Delhi	Expenditure met by sponsor
<b>ROADS AND RUNWAYS</b>			
124.	Construction of right approach road to Vasista Bridge in N.H. No. 5 (A.P.) at Sidhantn (CRRI)	Public Works Department, Andhra Pradesh, Hyderabad	Expenditure met by sponsor
125.	Eastern approach to Jamuna Bridge, Opp. Hamayun's Tomb (CRRI)	Central Public Works Department, New Delhi	Expenditure met by sponsor
126.	Failure of embankment at Joypurbeel near Calcutta (CRRI)	Ministry of Transport (Road Wing) & Special Roads Directorate, P.W.D., West Bengal, Calcutta	Rs. 1,500 plus TA/DA of staff
127.	Master Plan of Delhi for improvement of road pavements (CRRI)*	Municipal Corporation, Delhi	Expenditure met by sponsor

(1)	(2)	(3)	(4)
128. Pavement designs for the approach road to Cement Factory at Kurkunta, investigations on (CRRI)*	Cement Corporation of India, New Delhi	Expenditure by sponsor	met
129. Quality control on the compaction of sub-grade of runway at Santa Cruz, Bombay (CRRI)	Central Public Works Department (Aviation), Delhi	Expenditure by sponsor	met
130. Roads in Himachal Pradesh, investigation of (CRRI)*	Public Works Department, H.P., Simla	Expenditure by sponsor	met
131. Setting up a field laboratory for material testing and training of personnel (CRRI)	Directorate General of Border Roads, New Delhi	Expenditure by sponsor	met
132. Srinagar-Sonemarg Road, investigation of (CRRI)*	Public Works Department (B&R), Kashmir, Srinagar	Expenditure by sponsor	met
133. Survey of Barmer, Jaisalmer, Khajuraho and Babatpur Aerodromes (CRRI)	Central Public Works Department (Aviation), Delhi	Expenditure by sponsor	met
134. Survey of soils and locally available materials for the construction of roads near Amritsar (CRRI)	Chief Engineer, PWD (B&R), Punjab, Chandigarh	Expenditure by sponsor	met
135. Survey of soils and highway engineering material for Rajasthan Canal Board (CRRI)	Rajasthan Canal Board	Expenditure by sponsor	met
136. Testing of coated aluminium plates for anti-skid properties (CRRI)*	R&D Establishment, Defence Research and Development Organisation, Poona	Expenditure by sponsor	met
137. Unevenness index of Ghaziabad-Roorkee Road, determination of (CRRI)*	Public Works Department, U.P., Lucknow	Expenditure by sponsor	met
138. Unevenness index of Agra-Mathura Road, determination of (CRRI)*	Public Works Department, U.P., Lucknow	Expenditure by sponsor	met
139. Unevenness of overlaid pavements of runways at Palam, measurement of (CRRI)*	Aviation (D.W. II), New Delhi	Expenditure by sponsor	met
140. Widening of Nazafgarh-Dhansa Road (CRRI)*	Municipal Corporation, Delhi	Expenditure by sponsor	met

#### BUILDINGS AND BUILDING MATERIAL

141. Sintering of raw materials for the production of portland cement (RRL, Hyderabad) Gujarat Cement Ltd., Bombay-1 Rs. 2,000 plus raw materials

#### PUBLIC HEALTH ENGINEERING

142. Defluoridation of Nalgonda Water Supply (CPHERI) Public Health Department, Govt. of Andhra Pradesh, Hyderabad Rs. 10,000

143. Defluoridation studies to develop a community type unit of treatment plant (CPHERI) Public Health Engineering Department, Govt. of Rajasthan, Jaipur Cost of installation and maintenance borne by sponsor

144. High rate digestion of sludge (CPHERI) Municipal Corporation, Hyderabad 50% cost of pilot plant

(1)	(2)	(3)	(4)
145.	Industrial waste survey of Asansol-Durgapur Industrial Complex (CPHERI)	Durgapur Development Authority, Durgapur	TA/DA of staff
146.	Investigation of Agra Water Works (CPHERI)	Govt. of U.P., Lucknow	Rs. 4,500
147.	Investigation of 14 water works in U.P. (CPHERI)	Govt. of U.P., Lucknow	50% expenditure on survey
148.	Pilot plant filters at Delhi Zonal Centre for investigation into Nematode infestation as a Vector (CPHERI)	Chief Engineer, Municipal Corporation, Delhi	Rs. 6,000 for remodelling and modification of existing filters
149.	Treatment and disposal of straw board waste (CPHERI)	Cellulose Products (I) Ltd., Ramol, Ahmedabad	Rs. 1,500
150.	Treatment of DDT wastes (CPHERI)	Hindustan Insecticides Ltd., New Delhi	Rs. 4,500
151.	Treatment of paper mill wastes (CPHERI)	(i) Orient Paper Mills, Amlai (ii) Orient Paper Mills, Brajrajnagar (iii) National Newsprint and Paper Mills Ltd., Nepanagar	Rs. 10,000 Cost of investigation borne by party TA/DA of staff

#### INSTRUMENTS AND EQUIPMENT

152.	Blooming of optics (CSIO)*	Hargolal & Sons, Ambala Cantt.	Expenditure met by sponsor
153.	Box Camera objectives (CSIO)*	Vedsons & Co., New Delhi	Expenditure met by sponsor
154.	Centring, edging and curve generation of lens blanks (CSIO)	Prince Optical Works, Delhi	Expenditure met by sponsor
155.	Conductivity bridge (CSIO)*	Panjab University, Chandigarh	Rs. 1,500
156.	Data logging system (NAL)	Research Development & Standards Organisation, Lucknow	Rs. 15,200
157.	Device for maintaining blood pressure of animals (CSIO)*	Institute of Post-graduate Medical Education & Research, Chandigarh	Rs. 390
158.	Differential amplifier (CSIO)*	Institute of Post-graduate Medical Education & Research, Chandigarh	Rs. 1,000
159.	Electron diffraction camera (NCL)	(i) Gauhati University, Gauhati (ii) Fertilizer Corpn. of India, Sindri (iii) Defence Science Laboratory, New Delhi	Rs. 25,000 (3 years) — —
160.	Epidiascope mirrors and Huygenian eyepieces (CSIO)	Laboratory Equipment Traders, Ambala Cantt.	Expenditure met by sponsor
161.	Epidiascope mirrors and visual colorimeter optics (CSIO)	Oriental Science Apparatus Workshops, Ambala Cantt.	Expenditure met by sponsor

(1)	(2)	(3)	(4)
162. Equipment survey (IIP)	Planning Commission, New Delhi	Expenditure borne by sponsor	
163. Filament winding machine, fabrication of (NAL)	Bond Strand, Madras	n.a.	
164. Nose cones for weather rockets, fabrication and testing of (NAL)	Thumba Equitorial Rocket Launching Station, Thumba	Rs. 9,400	
165. Process camera prism, 76 mm and 89 mm (CSIO)	Monotype Corporation Ltd., Bangalore	Expenditure borne by sponsor	
166. Shunt device (CSIO)*	Institute of Post-Graduate Medical Education & Research, Chandigarh	Rs. 150	
167. Special purpose analogue computer (NAL)	Thumba Equitorial Rocket Launching Station, Thumba	Rs. 10,000	
168. Stimulator Model 203 M.C. (CSIO)*	(i) Institute of Post-Graduate Medical Education & Research, Chandigarh (ii) Director, IIEM, Calcutta	Rs. 2,500 Rs. 2,500	
169. 2" x 4" Supersonic wind tunnel test section with a pair of 2.5 Mach wooden nozzle blocks and a 4" field schlieren system and contraction and Aerofoil Model (NAL)	Indian Institute of Technology, Kharagpur	Rs. 25,750	
170. Templates and test plates (CSIO)	Universal Optics, Roorkee	Expenditure met by sponsor	
171. Transducer amplifier (NAL)	Thumba Equitorial Rocket Launching Station, Thumba	Rs. 1,600	
172. Two component wind tunnel balance (NAL)	Thumba Equitorial Rocket Launching Station, Thumba	Rs. 5,800	
173. Wind tunnel components and schlieren system (NAL)	Birla Institute of Technology, Ranchi	Rs. 5,050	

#### PLANT AND MACHINERY

174. Coke calcination plant at Barauni (IIP)	Indian Oil Corporation, H.O. New Delhi	Actual expenditure met by sponsor
175. Diaphragm cells of 10,000 amp. capacity for manufacture of caustic soda in collaboration with CECRI (PEC)	Mettur Chemicals and Industrial Corporation Ltd., Mettur	The firm has agreed to build the prototype and install in their works
176. Fresh water from brackish water by electrodialysis (1000 gal/hr.) (CSMCRI)	Industrial & Agricultural Engineering Co. Pvt. Ltd., Bombay	Expenditure on plant and salary of staff for running the plant met by sponsor
177. Transformer oil plant (IIP)	Sikri and Grover, Bombay	Actual expenditure met by sponsor

#### GEOPHYSICS

178. Airborne magnetometer and scintillometer surveys in Bundelkhand area of M.P. (NGRI)	Director of Geology & Mining, M.P., Nagpur	Expenditure met by sponsor
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\*Schemes completed

(1)	(2)	(3)	(4)
<b>B. SCHEMES/WORK UNDERTAKEN AT THE INSTANCE OF USER ORGANISATIONS FREE OF CHARGE</b>			
Sl. No.	Title of Scheme/Work	Sponsoring Authority	
<b>SURFACE COATINGS</b>			
1.	Anti-corrosive paints for ship bottom (RRL, Hyderabad)	Director of Scientific Research, Ministry of Defence, Govt. of India, New Delhi	
2.	High temperature enamel for jet air craft engine exhaust system parts (nimonic alloy and heat resistant steel) (CGCRI)	Gas Turbine Research Establishment, Ministry of Defence, Bangalore	
3.	Protective enamels for aluminium alloy parts of aircraft (compressor rotor blades) (CGCRI)	Gas Turbine Research Establishment, Ministry of Defence, Bangalore	
<b>GLASS, REFRactories AND CLAYS</b>			
4.	Fixation of high level atomic waste in glass (CGCRI)	Atomic Energy Commission	
5.	High alumina refractories (CGCRI)	Phillips Carbon, Calcutta	
6.	Oil well cement (CGCRI)	Oil and Natural Gas Commission, Dehra Dun	
7.	Utilisation of "Vegastone" (CGCRI)	Planning Commission, New Delhi	
<b>MINING</b>			
8.	Adjustment in the stock of sand for aerial rope-way 'D' (CMRS)	Coal Board, Calcutta	
9.	Operational research on pumping in mines—Sijua and Jitpur Colliery (CMRS)	Coal Board, Calcutta	
<b>COAL AND CARBON PRODUCTS</b>			
10.	Bulk washing of Kathara coals for carbonisation tests (CFRI)*	Bokaro Steel Ltd., Bokaro	
11.	Carbonisation potentialities of Kathara coals in blends with washed Dugda I and washed Kargali coals (CFRI)	National Coal Development Corporation, Ranchi	
12.	Carbonisation tests with Kathara-Kargali, Dugda I and Argada-Sirka coals (CFRI)*	Bokaro Steel Ltd., Bokaro	
13.	Carbonisation tests with washed Kathara, washed Bhojudih, washed Dugda II, washed Sawang and washed Bhurkunda coals (CFRI)	Hindustan Steel Ltd., Ranchi	
14.	Determination of the optimum weight of coal samples for float and sink tests (CFRI)	Indian Standards Institution, New Delhi	

(1)	(2)	(3)
15. Study on the stabilisation of coke during transit from wharf blast furnace skip (GFRRI)		Research and Development Committee, Coal Development Council
<b>METAL PROTECTION</b>		
16. Protection of structures made of iron and steel at Mangalore Harbour Project (CECRI)		Chief Engineer & Administrator, Mangalore Harbour Project, Mangalore
<b>PETROLEUM AND PRODUCTS</b>		
17. Aromatic chemicals from iomex (IIP)		Ministry of Petroleum and Chemicals, New Delhi
18. ATF Quality Control Project (IIP)		Indian Oil Corporation, H.O., New Delhi
19. Atmospheric residues at Koyali, processing of (IIP)		Indian Oil Corporation, H.O., New Delhi
20. Aviation gasoline, manufacture of (IIP)		Ministry of Petroleum and Chemicals, New Delhi
21. Barauni petro-chemical project (IIP)		Ministry of Petroleum and Chemicals, New Delhi
22. Barauni refinery problems (IIP)		Indian Oil Corporation, H.O., New Delhi
23. Cambay natural gas condensate, utilisation of (IIP)		Oil and Natural Gas Commission, Dehra Dun
24. Catalytic reforming along with pretreatment, computer programming for material balance (IIP)		Planning Commission, New Delhi
25. Comparison of Gauhati kerosene with commercial kerosene (IIP)		Indian Refineries Ltd., H.O., New Delhi
26. Deodorised iomex, manufacture of (IIP)		Indian Oil Corporation, H.O., New Delhi
27. Down grading of high speed diesel oil (IIP)		Caltex Ltd., Bombay
28. Evaluation of crude from Kalol Well (IIP)		Oil and Natural Gas Commission, New Delhi
29. Food grade hexane from Ankleswar crude, manufacture of (IIP)		Ministry of Health, Family Planning and Urban Development, Govt. of India, New Delhi
30. Greases, manufacture of (IIP)		Ministry of Petroleum and Chemicals, New Delhi
31. Haldia refinery project (IIP)		Ministry of Petroleum and Chemicals, New Delhi
32. Hydrogenation and hydrotreating process and hydrotreating plant at Barauni (IIP)		Indian Oil Corporation, H.O., New Delhi
33. Indian crude oils, processing of (IIP)		Ministry of Petroleum and Chemicals, New Delhi
34. Iso-octane, pilot plant manufacture of (IIP)		Ministry of Petroleum and Chemicals, New Delhi

(1)	(2)	(3)
35. Kathara crude evaluation (IIP)	Ministry of Petroleum and Chemicals, New Delhi	
36. Lakwa crude evaluation (IIP)	Oil and Natural Gas Commission, Dehra Dun/Indian Oil Corporation, New Delhi	
37. Lubricating oil from Kalol crude (IIP)	Ministry of Petroleum and Chemicals, New Delhi	
38. Lube plant—Rumanian proposal (IIP)	Ministry of Petroleum and Chemicals, New Delhi	
39. Lube survey (IIP)	Ministry of Petroleum and Chemicals, New Delhi	
40. Market survey and uses of Digboi lubricants (IIP)	Indian Oil Corporation, H.O. New Delhi	
41. Petroleum products, distribution studies (IIP)	Ministry of Petroleum and Chemicals, New Delhi	
42. Smoke point improvers for kerosene (IIP)	Indian Refineries Ltd., H. O. New Delhi	
43. Use of blends of JP4 and high speed diesel oil (IIP)	JP4 Working Group	

#### BUILDINGS AND BUILDING MATERIALS

44. Ancillary structures for in-sewerage system (CBRI)*	Indian Standards Institution, New Delhi
45. Anthropometric dimensions of school buildings (CBRI)*	Indian Standards Institution, New Delhi
46. Building foundation in Calcutta region (CBRI)*	Chief Engineer (Housing), Government of W. Bengal, Calcutta
47. Burst strength of plastic pipes for fluid transportation (CBRI)	Indian Standards Institution, New Delhi
48. Cast copper alloy trap (CBRI)	Indian Standards Institution, New Delhi
49. Concrete porous pipes for under drainage (CBRI)*	Indian Standards Institution, New Delhi
50. Epoxy resin floor topping (CBRI)	Indian Standards Institution, New Delhi
51. Finishing of wood and wood based material (CBRI)*	Indian Standards Institution, New Delhi
52. Fire safety in industrial buildings (CBRI)*	Indian Standards Institution, New Delhi
53. Heavy duty industrial floor finishes (CBRI)*	Indian Standards Institution, New Delhi
54. Load bearing hollow concrete blocks (CBRI)*	Indian Standards Institution, New Delhi
55. Reed walling (CBRI)*	Indian Standards Institution, New Delhi
56. Reinforced brick masonry (CBRI)*	Indian Standards Institution, New Delhi
57. Rubble stone masonry (CBRI)*	Indian Standards Institution, New Delhi
58. Suitability of Rajasthan canal area soil for the manufacture of bricks (CBRI)*	Rajasthan Canal Board

(1)	(2)	(3)
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### PUBLIC HEALTH ENGINEERING

59. Construction of oxidation ponds (CBRI)\* Indian Standards Institution, New Delhi

60. Design of mobile filter for defence purposes (CPHERI) Ministry of Defence, Govt. of India, New Delhi

61. Treatment of high explosive waste (CPHERI) High Explosive Factory, Kirkee, Poona

### INSTRUMENTS, EQUIPMENT AND MACHINERY

62. Dial indicator and other mechanical measuring instruments (CSIO) Amar Machine Tools, Ludhiana

63. Flame photometer (CSIO) Photo Electric Instruments, Jaipur

64. Operation of vehicles in high altitudes & cold regions—problem of power loss of fuel and lubricants (IIP) Ministry of Defence, Govt. of India, New Delhi

65. Optical pyrometer (CSIO) Photo Electric Instruments, Jaipur

66. Remedy to power loss of engines in altitudes (Willys Jeep engine) (IIP) Ministry of Defence, Govt. of India, New Delhi

67. Strain gauge balance, design and manufacture of (NAL) Indian Institute of Science, Bangalore

68. Traffic counter and speed indicator (NAL) Commissioner of Police, Bangalore

\*Schemes completed

**TABLE 8—SPONSORED PROJECTS**

FOR BASIC SCIENTIFIC INVESTIGATIONS (1967-68)

Sl. No.	Title of Scheme	Sponsoring Authority	Terms
(1)	(2)	(3)	(4)
<b>CHEMICALS</b>			
<b>Drugs and Pharmaceuticals</b>			
1.	Composite drug research scheme on Indian medicinal plants (NCL)	Ministry of Health, Family Planning and Urban Development, Govt. of India, New Delhi	Rs. 36,145
2.	Composite drug research scheme (a) Pharmaconogy research unit and (b) Survey, supply, enquiry unit (NBG)	Indian Council of Agricultural Research, New Delhi	Expenditure met by sponsor
3.	Distribution and binding of cardiac drugs by heart tissue in different species of animals (IIMR)	Indian Council of Medical Research, New Delhi	Rs. 6,745
4.	Potential anti-cancer agents (CDRI)	National Institute of Health, U.S.A.	Rs. 2,79,100
<b>Pesticides</b>			
5.	Studies on certain plant (inclusive of neem) extracts and isolates having pesticidal properties (NBG)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure met by sponsor
<b>Resins</b>			
6.	Constitution of lac (NCL)	Indian Lac Cess Committee (ICAR), Ranchi	Rs. 10,600 (5 years 5 months)
<b>Other Chemicals</b>			
7.	Synthesis and properties of new type glycol monoalkyl ethers for the control of water evaporation to extend the industrial utilisation of cottonseed oil (NCL)	Department of Agriculture, U.S.A. (P.L. 480)	Rs. 88,360 per year (5 years)
8.	Wood phenolics with special reference to their use in chemotaxonomy and their biosynthesis by tissue culture studies (NCL)	Department of Agriculture, U.S.A. (P.L. 480)	Rs. 1,27,040 per year (3 years)
<b>HEALTH AND NUTRITION</b>			
9.	Antifertility plant material, investigations on (CDRI)	Indian Council of Medical Research, New Delhi	Rs. 16,650
10.	Antifertility research programme, expansion of (CDRI)	Ministry of Health, Family Planning and Urban Development, New Delhi	Rs. 47,95,000 (5 years)
11.	Cholera enquiry (CDRI)	Indian Council of Medical Research, New Delhi	Rs. 13,250 (1967-68)
12.	Disinfection techniques for small community water supplies (CPHERI)	World Health Organisation, Geneva	Rs. 30,000 (1967)

(1)	(2)	(3)	(4)
13. Distribution of aerobic actinomycetes in India (CDRI)	Department of Agriculture, U.S.A. (P.L. 480)	Rs. 3,13,290	
14. Genetics of Vibrio cholerae (CDRI)	World Health Organisation, Geneva	\$ 5,000	
15. International Reference Centre for Vibrio Phage typing (IICM)	World Health Organisation, Geneva	\$ 3,500 per year	
16. Physiological evaluation of miners' work (CMRS)	Indian Council of Medical Research, New Delhi	Staff provided by sponsor	
17. Physiology of reproduction (CDRI)	Ford Foundation, U.S.A.	\$ 290,000	
18. Protein rich foods and their nutritive value (CFTRI)	National Institute of Health, U.S.A.	Rs. 45,93,082 (4 years)	
<b>FOODS AND BEVERAGES</b>			
19. Animal food production from waste waters (sewage) (NBG)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure met by sponsor	
20. Control of microflora and related production of mycotoxins in stored sorghum, rice and groundnut (CFTRI)	Department of Agriculture, U.S.A. (P.L. 480)	Rs. 8,00,000 (5 years)	
21. Chemical structure of the tannins and polyphenolic polymers in fruits and contribution to the development of processing methods to control the adverse effects of these substances in fruit products (CLRI)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure met by sponsor	
<b>VEGETABLE OILSEEDS AND OILS</b>			
22. Effect of heat on tung oil and derivatives of tung oil and the characterisation and identification of compounds resulting from heat treatment to extend the utilisation of tung oil (NCL)	Department of Agriculture, U.S.A. (P.L. 480)	Rs. 46,300 per year (5 years)	
23. Hydroxylated derivatives of safflower and linseed oils (RRL, Hyderabad)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure met by sponsor	
24. Mycotoxins in cottonseed, a preliminary survey of the growth of <i>Aspergillus flavus</i> and the production of aflatoxin in cottonseed (RRL, Hyderabad)	Department of Agriculture, U.S.A. (P.L. 480)	Rs. 1,29,110	
25. Polymerisable monomers from castor oil hydroxy unsaturated fatty acids (RRL, Hyderabad)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure met by sponsor	
<b>LEATHER AND AUXILIARIES</b>			
26. Hydrothermal shrinkage of collagen and leather to obtain fundamental information (CLRI)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure met by sponsor	

(1)	(2)	(3)	(4)
27.	Inter-relationship of hide quality with the rate of tanning and efficiency of tanning (CLRI)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure by sponsor met
28.	Mode of reaction of polyphenolic tanning compounds with hide protein (CLRI)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure by sponsor met
29.	Polypeptidyl derivatives of collagen and determination of their physico-chemical properties to obtain information for use in developing leather with improved properties (CLRI)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure by sponsor met
30.	Radio active tracer study of mineral tanning operation with special reference to the kinetics, stability and uptake of the mineral tanning complexes as a basis for improving mineral tanning process (CLRI)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure by sponsor met
31.	Test procedures for quantitatively evaluating the comfort properties of shoe leather (CLRI)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure by sponsor met
<b>REFRACTORIES</b>			
32.	Chemical and thermodynamic properties of refractory materials at high temperature (NCL)	National Bureau of Standards, Washington (P.L. 480)	Rs. 1,90,000 per year (5 years)
<b>PHYSICS</b>			
<b>Solid State Physics</b>			
33.	Crystal growth (NPL)	National Bureau of Standards, Washington (P.L. 480)	Expenditure by sponsor met
34.	Dielectric properties of rutile structures and Domain Dynamics in ferroelectrics, ferromagnets of internal fields of Mossbauer techniques (NPL)	National Bureau of Standards, Washington (P.L. 480)	Expenditure by sponsor met
35.	Physical properties and irradiation effects of ionic crystals and semiconductors with a view to develop more useful solid state devices (NPL)	National Bureau of Standards, Washington (P.L. 480)	Expenditure by sponsor met
<b>Ionospheric Physics</b>			
36.	Study of F-layer effects with Doppler fading technique (NPL)	U.S. Department in collaboration with C.R.P.L., U.S.A. (P.L. 480)	Expenditure by sponsor met
<b>Geophysics</b>			
37.	Electromagnetic wave propagation (NGRI)	National Bureau of Standards, Washington	Rs. 1,20,000 (3 years)
<b>BIOLOGY</b>			
38.	Induction, augmentation and production of virus-free nucleus seedlings in citrus by using tissue culture technique (NBG)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure by sponsor met
39.	Studies of water soluble seed mucilage (NBG)	Department of Agriculture, U.S.A. (P.L. 480)	Expenditure by sponsor met

**TABLE 9—CONSULTATION, DESIGN AND ENGINEERING SERVICES**

(1967-68)

Sl. No.	Title	Name of the Party	Terms
(1)	(2)	(3)	(4)
<b>National Chemical Laboratory, Poona</b>			
1.	General Technical Consultancy	Amar Dye Chem. Ltd., Bombay	18,000 (1 year 11 months upto 30-6-68)
2.	General Technical Consultancy	Aniline Dyestuffs and Phar- maceuticals Ltd., Bombay	9,000 (3 years up to 31-5-69)
3.	General Technical Consultancy	Surfactants Private Ltd., Bombay	9,000 (2 years 9 months upto 28-2-69)
4.	General Technical Consultancy	Cema Private Ltd., Bombay	7,200 (1 year upto 31-12-67)
5.	General Technical Consultancy	J.K. Synthetics Ltd., Kanpur	20,000 (2 years up to 18-2-69)
<b>National Physical Laboratory, New Delhi</b>			
6.	Assembly to generate hydrogen bromide	Indian Drugs and Pharma- ceuticals Ltd., Hyderabad	200
7.	Graphitisation of electrodes for caustic soda chlorine cell	Dharangdhra Chemical Works Ltd., Madurai	400
<b>Central Fuel Research Institute, Dhanbad</b>			
8.	Drawing of coal samples from Hutar Colliery	The Sone Valley Portland Cement Co. Ltd., Cal- cutta	TA/DA of staff
9.	Suitability of washery rejects as domestic fuel	The Associated Cement Co. Ltd., Bombay-1	416
<b>National Metallurgical Laboratory, Jamshedpur</b>			
10.	Beneficiation of magniferous clay from Goa	Chowgule & Co. Pvt. Ltd., Marmgao, Goa	2,000
11.	Melting of stainless steel scrap	Bharat Darshan Steel Ltd., Jagadhari, Haryana	1,000
12.	Sintering of iron ore fines	Mysore Iron and Steel Works Ltd., Bhadravati	10,000
<b>Central Drug Research Institute, Lucknow</b>			
13.	General Technical Consultancy	Unichem Laboratories Ltd., Bombay	10,000 (one year upto Aug. 1967)

(1)	(2)	(3)	(4)
<b>Central Road Research Institute, New Delhi</b>			
14. Compaction of sand	Chief Engineer, Aero Engine Factory, Sunabada, Orissa	TA/DA of staff	
15. Design of roads in snow-bound high altitude areas	Officer Commanding Laboratory, Ministry of Defence	TA/DA of staff	
16. Improvement of busy intersections in Amritsar	Public Works Department (B & R), Punjab, Amritsar	TA/DA of staff	
17. Improvement of an important intersection on Delhi-Bombay National Highway Road near Agra	Public Works Department, Uttar Pradesh, Agra	TA/DA of staff	
18. Improvement of intersections and road alignment on Delhi-Hissar National Highway near Hissar	Public Works Department (B & R), Haryana, Hissar	TA/DA of staff	
19. Installation of traffic control devices at road-rail grade crossing	Research Design and Standards Organisation, Ministry of Railways, Lucknow	TA/DA of staff	
20. Planning of comprehensive traffic and transportation studies to be conducted in greater Madras and Bombay	Metropolitan Transport Team, Planning Commission, New Delhi	TA/DA of staff	
21. Specifications of roads	Planning Engineer, Municipal Corporation, Delhi	TA/DA of staff	
22. Traffic and transport problems in Hyderabad and Secunderabad	Hyderabad Traffic Police, Hyderabad	TA/DA of staff	
<b>Central Electro-Chemical Research Institute, Karaikudi</b>			
23. Setting up of a 30 tons/year Benzidine plant	Kabbur Dyes Pvt. Ltd., Bombay	Rs. 5,000	
<b>Central Leather Research Institute, Madras</b>			
24. General consultancy under "Retainer Scheme"	1. Bata Shoe Company, Batanagar 2. East India Chrome Tannery Ltd., Calcutta 3. Gujarat Rajya Khadi Gramodyog Mandir, Junagarh 4. Associated Tanners, Vizianagaram 5. Godhwani Brothers, Bombay-17 6. I. E. C. Limited, Calcutta-19 7. Zaz Tannery, Kanpur 8. Madan Leathers, New Delhi-5	1,000 1,000 100 1,000 1,000 1,000 500 100	

(1)	(2)	(3)	(4)
9.	British India Corporation, Cooper Allen Branch, Kanpur	1,000	
10.	Kapurthala Northern India Tanneries, Kapurthala	1,000	
11.	Gold Filled Leather Works, Bombay-17	500	
12.	Chrome Leather Company P. Ltd., Madras-44	1,000	
13.	Bimal Leather Industries, P.O. Samiyala	100	
14.	Leathers India Tannery, Kalpakanchery	100	
15.	Pol & Company, Kolhapur	100	
25.	Application of cold dyeing reactive dyes for leather and providing know-how	Amar Dye Chem. Limited, Bombay	12,500 every six months for 5 years
26.	Blue Chrome, manufacture of	Barkatullah & Company, Lucknow	50
27.	E. I. Process	Associated Tanners, Vizianagaram	480
28.	Full chrome upper leather and retanned upper leather	E. K. Leather Manufacturing Co., Erode	266
29.	Process using leached liquor	Associated Tanners, Vizianagaram	220
30.	Rectifying defects in sole leather	Hyderabad Tanneries, Hyderabad	175
31.	Remodelling the tannery for standardisation of production of wet blue goat skins for export	East India Chrome Tannery Ltd, Calcutta	5,000
32.	Servicing of machinery	<ol style="list-style-type: none"> <li>1. Perambur Chrome Tannery, Perambur.</li> <li>2. F. K. Haseeb &amp; Company, Melvisharam.</li> <li>3. Maypar Leather Manufacturing Company, Pallavaram</li> <li>4. South East Asia Company, Ambur</li> </ol>	<ol style="list-style-type: none"> <li>72</li> <li>25</li> <li>77</li> <li>255</li> </ol>
33.	Sole leather process	Zaz Tannery, Kanpur	300
34.	Suede leather for garment, manufacture of	Abdul Shakoor & Co., Vellore	290
35.	Survey work	British India Corporation, Cooper Allen Branch, Kanpur	1,400
36.	Tanning and finishing of kattai & bunwar	Madan Leathers, New Delhi	920

(1)	(2)	(3)	(4)
37. Technical Assistance		British India Corporation, Cooper Allen Branch, Kanpur	815
38. Technical Assistance		Associated Tanners, Vizianagaram	325
39. Technical Assistance regarding dyeing chamber		South East Asia Company, Ambur	180

#### **Central Salt and Marine Chemicals Research Institute, Bhavnagar**

40. Mixed salt, production of	Hindustan Salts Ltd., Kharaghoda	TA/DA of scientists
41. Mixed salt, production of	United Salt and Industrial Works, Kandla	-do-
42. Soil testing, soil stabilisation of crystallizer pans and improvement in yield of salt.	Kutch Salt and Allied Industries, Kandla	-do-
43. Stabilisation of soil from Gudha	Sambhar Salts Ltd., Sambhar (Rajasthan)	-do-
44. Survey of brines of Kharaghoda Salt Works	Hindustan Salts Ltd., Kharaghoda	-do-

#### **Regional Research Laboratory, Hyderabad**

45. General Technical Consultancy	Andhra Sugars Ltd., Tanuku	30,000 (three years upto 31-8-69)
46. General Technical Consultancy	Commercial Chemical Co., Hyderabad	15,000 (three years upto 13-3-69)
47. General Technical Consultancy	Hyderabad Allwyn Metal Works Ltd., Hyderabad	30,000 (three years upto 29-12-67)
48. Designs and drawings for a fractionating column for production of terpene chemicals	Dujodwala Chemicals, Bombay	10,000
49. Erection of QVF equipment in factory	T. I. Cycles (India) Ltd., Ambattur, Madras	Rs. 1,500 plus TA/DA of staff
50. Improvement of the process of manufacturing copper sulphate and modification in their present plant	Chemo Salts, Hyderabad	1,000
51. Suitability of Bentonite earth in the manufacture of activated earth	P. K. Bagla & Co., Calcutta	1,000

#### **Central Mechanical Engineering Research Institute, Durgapur**

52. Assistance for setting up of a drawing office	Kumardhubi Engg. Works Ltd., Kumardhubi	20,000/year (three years)
53. Development of suitable steel reel for wire drawing machine	Hindustan Wires Ltd., Calcutta	590
54. Development of wire drawing machine	MET Industries, Calcutta	2,000

(1)	(2)	(3)	(4)
55.	Investigations on Blast Furnace	Hindustan Steel Ltd., Central Engg. & Design Bureau, Durgapur	3,500
56.	Improvement of quality of casting	Kirloskar Brothers Ltd., Sangli	10,000 (one year)
57.	Selection of grinding wheel for making cycle sprockets .	MHS Sahney Engineers (P) Ltd., Durgapur	248

#### **Central Public Health Engineering Research Institute, Nagpur**

58.	Analysis of water samples and comparison of their results for effective quality control	Municipal Corporation, Delhi	3,986
59.	Improvement of quality of water from various sources	Maharashtra Industrial Development Corporation, Poona	905
60.	Investigation of effluent survey	New Victoria Cotton Mills, Kanpur	500
61.	Sewage and waste treatment problems at Rourkela Steel Plant	The Hindustan Steel Ltd., Rourkela, Orissa	TA/DA of scientists
62.	Study of dust concentration in High Explosive Factory atmosphere	High Explosive Factory, Kirkee	120

#### **Regional Research Laboratory, Jorhat**

63.	Flexible pavement design for Kamalpur Air Field	Executive Engineer, Assam Aviation Works, Divn. CPWD, Gauhati	500
64.	Flexible pavement design for Kailashahar Air Field	Executive Engineer, Assam Aviation Works, Divn. CPWD, Gauhati	680
65.	Safe bearing capacity of foundation soil for air control building extension at Gauhati Air Field	Executive Engineer, Assam Aviation Works, Divn. CPWD, Gauhati	200
66.	Safe bearing capacity of foundation soil in Narangi arch	Executive Engineer, CPWD, Central Divn. Gauhati	360

#### **Structural Engineering Research Centre, Roorkee**

67.	Analysis of Multi-storeyed frames (S.A. Section)	—	4,259
68.	Design of Bombay Council Hall	P. W. D., Maharashtra, Bombay	50,000
69.	Design of CSIR Pavilion at Indian International Trade & Industries Fair, Madras	Prynne Abbot & Davis Co., Madras	2,050
70.	Design of guide scoops for Engine Test House	Chief Engineer, C P W D, North-Western Zone, Chandigarh	1,000
71.	Computer Analysis of Cactus House	Panjab University, Chandigarh	3,500

(1)	(2)	(3)	(4)
72.	Computer Analysis of Inter-grid Beam System	Punjab Agricultural University, Ludhiana	2,266
73.	Computer Analysis of Microwave Tower	Coromandal Steel Ltd., Madras	3,240
74.	Computer Analysis of Roof Grid	Institution of Engineers, Chandigarh	2,000
75.	Computer Analysis of Transmission Line Towers for Burma	Electrical Manufacturing Co. Ltd., Calcutta	6,500

**Process Evaluation Cell, New Delhi**

76.	Design and Engineering of NPK Rallis India Ltd., Granulated Fertilizer Plan Bombay 15 tonnes/hr	1,00,000
1. Including consultation services continued from previous year.		
2. Not including advice given free of charge.		

**TABLE 10—PROJECT REPORTS SUPPLIED**

(1967-68)

Sl. No.	Title	Name of the Party	Charges, if any
(1)	(2)	(3)	(4)
<b>CHEMICALS</b>			
1.	Benzyl cyanide—feasibility report (RRL, Hyderabad)	Essar Chemicals, Dhulia	—
2.	Benzaldehyde—720 tonnes per annum—feasibility report (RRL, Hyderabad)	Ashoka Investment Corporation, Bombay	2,500
3.	Chloroform—1/2 tonne per day—feasibility report (RRL, Hyderabad)	Arun Chemicals & Pharmaceutical Works, Hyderabad	4,500
4.	Chloroform—300 kg/day—feasibility report (RRL, Hyderabad)	Besto Laboratories, Hyderabad	2,500
5.	Ethyl acetate—1 tonne/day—feasibility report (RRL, Hyderabad)	Besto Laboratories, Hyderabad	2,500
6.	Levulinic acid (RRL, Hyderabad)	Glaxo Laboratories, Bombay	—
7.	Low production of ammonium sulphate from the coke ovens and by-products plant of Durgapur Steel Plant (CFRI)	Hindustan Steel Ltd., Durgapur	7,000
<b>REFRACTORY MATERIAL</b>			
8.	Low grade kyanite for castable mortars—Utilisation of (CGCRI)	S. Lal and Co. Pvt. Ltd., Calcutta	1,041.60
9.	Testing of refractory castables for formulating I.S. Specifications (CGCRI)	Indian Standards Institution, New Delhi	—
<b>VEGETABLE OILS (INCLUDING ESSENTIAL OILS)</b>			
10.	Cottonseed processing—100 tonnes/ day (RRL, Hyderabad)	33 parties	—
11.	Cottonseed processing—30 tonnes/ day (RRL, Hyderabad)	5 parties	—
12.	Palmrosa oil (RRL, Hyderabad)	Several parties	—
<b>PULP AND PAPER</b>			
13.	Hand-made speciality paper (RRL, Hyderabad)	3 parties	—
<b>COAL AND CARBON PRODUCTS</b>			
14.	Floatation test on slurries from coals of Kargali seam at Kathara, East Bokaro Coal field (CFRI)	National Coal Development Corporation, Ranchi	9,820

(1)	(2)	(3)	(4)
15. Formed coke from Thai lignite (CFRI)	(1) Department of Mineral Resources, Govt. of Thailand, Bangkok (2) Siam Iron & Steel Co., Bangkok	—	—
16. Performance of Bhojudih Washery (CFRI)	Ministry of Steel & Mines, Govt. of India, New Delhi	—	—
17. Selection of coking blends for Rourkela Steel Plant—interim report (CFRI)	Hindustan Steel Ltd., Rourkela	—	—
18. Utilisation of Naditoli Seam Coals—South Karanpura Coal fields (CFRI)	National Coal Development Corporation, Ranchi	—	—
19. Vapour adsorbant carbon from coconut shell (RRL, Hyderabad)	Volkart (India) Ltd., Cochin	6,000	

#### METALS AND CORROSION

20. Aluminium alloys containing silicon—preliminary project report (NML)	(i) Premier Automobiles, Bombay (ii) Beegee Corporation Pvt. Ltd., Patiala (iii) Foundry and Engineering Service, Madras (iv) Jay Hind Industries, Pvt. Ltd., Poona	— — — —
21. *Corrosion of steel reinforcements in RCC and RCBW constructions and its prevention (CECRI)	National Buildings Organisations, New Delhi	—
22. Extraction characteristics of alumina from Gujarat Bauxite (NML)	The Director, Geology and Mining, Gujarat State, Ahmedabad	—
23. *Foundry shop at Tata's Central Workshop, Jamadoba (CMRS)	Chief Mining Engineer, TISCO, Jamadoba	300
24. *Magnesium metal on pilot plant scale by electrolytic process—12 kg/day (CECRI)	Government of Madras, Madras	—

#### PETROLEUM PRODUCTS

25. Reclamation of used lubricating oil, project report (IIP)	10 parties	500 (50 each)
26. Setting-up industry based on (a) Paraffin waxes and (b) lubricating oil base stock, feasibility report (RRL, Jorhat)	Harak Chand Sarawgi & Sons, Gauhati	6,000

#### MINING

27. Operational research on pumping in mines—Pootkee Colliery (CMRS)	1. Coal Board, Calcutta 2. The Agent, Pootkee Colliery, P.O. Kusunda	—
28. Operational research on pumping in mines—Sijua Colliery (CMRS)	The Chief Mining Engineer, TISCO, Jamadoba, P.O. Jealgora	—

(1)	(2)	(3)	(4)
29.	Premature failure of fly wheel (CMRS)	Sendra Bansjora Colliery, P.O. Bansjora, Dist. Dhanbad	100
30.	Roof bolting investigations in the top seam of Venkatesh Khai-7 incline (CMRS)	Jt. Director of Mine Safety, Warangal Region, P.O. Hanamkonda	—
31.	Stability of mine pillars at Zawar Mines (CMRS)	Hindustan Zinc Ltd., Zawar Mines, P.O. Udaipur	—
32.	Test Rig for centrifugal pump —design of (CMRS)	Kankanee Colliery Ltd., Pootkee Colliery, P.O. Kusunda, Dist. Dhanbad	250
33.	Tube link failure (CMRS)	The East Ghanuadih Colliery, P.O. Jharia, Dist. Dhanbad	50
34.	Ventilation survey (CMRS)	Pure Jambad Colliery, P.O. Ukhra, Dist. Burdwan	200
35.	Ventilation survey (CMRS)	East Nimcha Colliery, P.O. Jay Kay Nagar, Dist. Burdwan	900

#### ELECTRONIC EQUIPMENT

36.	Low cost radio receiver—preliminary report (CEERI)	25 parties	—
37.	Moving coil microphone—preliminary report (CEERI)	2 parties	—
38.	Table model transistor radio receiver—preliminary report (CEERI)	22 parties	—
39.	Television receiver—preliminary report (CEERI)	4 parties	—

#### ROADS AND RUNWAYS

40.	*Coated aluminium plates for anti-skid properties (CRRI)	R & D Establishment, Poona-15	—
41.	*Investigation of 16 roads in Himachal Pradesh (CRRI)	Public Works Department, Himachal Pradesh, Simla	—
42.	Locally available materials including soil for the construction of Border road, Bhuj-Khavda—Kunverbet Road (CRRI)	Public Works Department, Gujarat, Ahmedabad	35,000
43.	*Master Plan of Delhi for the improvement of road pavement (CRRI)	Municipal Corporation, Delhi	—
44.	*Pavement design of Jamuna Bridge approach (CRRI)	Central Public Works Department, New Delhi	—
45.	*Pavement design for the approach road to cement factory at Kurkunta, Mysore State (CRRI)	Civil Engineering Adviser, Cement Corporation of India, New Delhi	—
46.	Skid-resistance determination of landing mats (CRRI)	R & D Establishment, Poona-15	—

(1)	(2)	(3)	(4)
47. *Strengthening of pavement of Srinagar-Sonemarg Road (CRRI)	Chief Engineer, Kashmir, P.W.D. (R & B), Srinagar	—	—
48. *Unevenness index of Agra-Mathura Road (CRRI)	Public Works Department, Uttar Pradesh, Lucknow	—	—
49. *Unevenness index of Ghor-Roorkee Road (CRRI)	Engineer-in-Chief, Public Works Department, Uttar Pradesh, Lucknow	—	—
50. *Unevenness of overlaid pavement of 27 to 10 runways at Palam (CRRI)	Aviation, Division II, New Delhi	—	—
51. *Widening and strengthening of Najafgarh-Dhansa Road (CRRI)	Municipal Corporation, Delhi	—	—

## BUILDINGS AND BUILDING MATERIAL

### Buildings and Structures

52. *An inter-grid system, computer analysis of (SERC)	Punjab Agricultural University, Ludhiana	2,500
53. *Cactus House, computer analysis of (SERC)	Panjab University, Chandigarh	3,500
54. Experiments in urban housing (CBRI)	T. N. Sahu, Lucknow	—
55. Folded plate roof and columns, analysis and design of (SERC)	Rehabilitation Centre, ESIS Hospital, Muland, Bombay	2,000
56. *Grid roof for Institution of Engineers building, analysis of (SERC)	Institution of Engineers, Chandigarh	2,000
57. *Microwave tower, computer analysis of (SERC)	Coromandel Steel Ltd., Madras	3,240
58. Transmission line tower, computer analysis of (SERC)	Electrical Manufacturing Co., Calcutta	6,500

### Building Material Including Surface Coatings

59. A plastic masonry paint (CBRI)	1 party	—
60. Building lime from sugar press mud (CBRI)	5 parties	—
61. Cement paint—preliminary report (CBRI)	3 parties	—
62. Coconut husk particle board—preliminary report (CBRI)	3 parties	—
63. Coconut pith cement concrete for insulation (CBRI)	2 parties	—
64. Cotton linters, cottonseed husk and local bamboo for pulp cement roofing sheets, utilisation of (RRL, Jorhat)	T.G. Krishnamurty, Adoni	3,000

(1)	(2)	(3)	(4)
65.	Engineering bricks/paving bricks/ acid resistant bricks—preliminary report (CBRI)	3 parties	—
66.	Expansion joint filler—preliminary report (CBRI)	3 parties	—
67.	Fire resistant board (CBRI)	3 parties	—
68.	General purpose and heavy duty flooring tiles from magnesium oxy-chloride cement—preliminary report (CBRI)	1 party	—
69.	Gypsum plaster board (CBRI)	2 parties	—
70.	Pulp wastes from a paper factory, use in the pulp cement sheet manufacture—feasibility report (RRL, Jorhat)	Sri Srinivas Cement Products, Kakinada	500
71.	Semi-mechanised process for brick manufacture (CBRI)	7 parties	—
72.	Sintered fly-ash aggregate (CBRI)	2 parties	—
73.	Water and weather resistant coating —preliminary report (CBRI)	3 parties	—
<b>PUBLIC HEALTH ENGINEERING</b>			
74.	Assessment of air pollution problem in Calcutta Metropolitan Area—a plan (CPHERI)	Govt. of West Bengal, Calcutta	—
75.	Improvement of quality of water of Ulhas river (CPHERI)	Indian Dyestuff Industries Pvt. Ltd., Bombay	—
76.	Operational problems at Kanhan Water Works (CPHERI)	Administrator, Municipal Corporation, Nagpur	TA of scientists
77.	Oxidation pond (CPHERI)	Bharat Heavy Electricals Ltd., Ranipur	—
78.	Pilot plant studies on plastic pipes (CPHERI)	Indian Standards Institution, New Delhi	—
79.	Pollution of air at Kovvur by the stack discharges of Chemicals & Fertilizers Division, Andhra Sugars Ltd. (CPHERI)	Director of Public Health, A. P., Hyderabad	TA/DA of scientists
80.	Prevention of nuisance due to fertiliser factory flue gases and sulphuric acid plant of EID Parry Ltd., Tadepalli (CPHERI)	Director of Public Health, A.P., Hyderabad	TA/DA of scientists
81.	Raw water characterisation of river Khan & Kshipra and Upper Lake, Bhopal (CPHERI)	Public Health Engineer, Govt. of M.P., Bhopal	—
82.	Reduction of water pollution due to Orient Paper Mills—interim report (CPHERI)	Orient Paper Mills, Amlai (M.P.)	5,000
83.	Sewage disposal scheme (CPHERI)	Director, Gandhi Memorial Leprosy Foundation, Wardha	—

(1)	(2)	(3)	(4)
84.	Sewage disposal scheme for Kurkunta township, a residential colony of Cement Corporation of India Ltd., Kurkunta (Mysore) (CPHERI)	Cement Corporation of India Ltd., New Delhi	—
85.	SO <sub>2</sub> gas emission from the acid plant of M/s Century Rayon, Kalyan (CPHERI)	(i) Amar Dye Chem. Ltd., TA/DA of scientists Kalyan (ii) Director of Public Health, Maharashtra, Bombay (iii) Century Rayon, Kalyan	—
86.	Stack gas analysis for SO <sub>2</sub> emissions (CPHERI)	(i) Krishna Industrial Corpn., Nidadavole, A.P. (ii) Director, Health Services, Hyderabad, A.P.	TA/DA of scientists
87.	*Treatability of DDT wastes—interim report (CPHERI)	Hindustan Insecticides Ltd., New Delhi	—
88.	Treatment and disposal of factory effluents (CPHERI)	Kanoria Chemicals and Industries Ltd., Renukoot	500

#### GEOPHYSICAL INVESTIGATIONS

89.	Airborne magnetometer and scintillometer surveys over a part of the Chitaldrug schist belt (NGRI)	Department of Mining and Geology, Mysore	—
90.	Basic mine valuation problems at Kolar Gold Fields—preliminary report (NGRI)	Kolar Gold Fields Undertaking, Mysore	—
91.	Electrical resistivity survey for ground water around Shakarnagar (NGRI)	Nizam Sugar Factory, Nizamabad	—
92.	Electrical resistivity survey for ground water (NGRI)	MERDO Centre, Madras	—
93.	Electrical resistivity survey for ground water at the astrophysical site at Kavalur, Dist. North Arcot (NGRI)	Astrophysical Laboratory, Kodiakanal	—
94.	Geophysical survey of archaeological site in Kali Bangan, Rajasthan (NGRI)	Archaeological Survey of India, New Delhi	—
95.	Geophysical prospecting for copper deposits in Khetri Copper Belt, Rajasthan (NGRI)	National Mineral Development Corporation Ltd., Faridabad	—

(1)	(2)	(3)	(4)
96.	Ground water investigations near Medchal, Dist. Hyderabad (NGRI)	Hyderabad Chemicals and Pharmaceuticals Ltd., Hyderabad	—
97.	Ground water investigations near Ghatkesar, Dist. Hyderabad (NGRI)	Birla Institute of Scientific Research, Secunderabad	—
98.	Resistivity requirements for depth to basement near Kutab Minar, New Delhi (NGRI)	Archaeological Survey of India, New Delhi	—

\*Reports concerning sponsored schemes/consultation services

TABLE 11—PILOT PLANTS PROJECTS IN CSIR LABORATORIES

(1967-68)

Sl. No.	Title of the Pilot Plant/Project	Year of starting
(1)	(2)	(3)
<b>CHEMICALS</b>		
1.	Aminoguanidine bi-carbonate and sulphate (CECRI)	Under erection
2.	Aniline (NCL)	1963
3.	Benzyl chloride (250 kg/day) (RRL, Hyderabad)*	1965
4.	BON acid (NCL)*	1961
5.	Chlorination of ethylene (NCL)*	1963
6.	Citric acid by the submerged fermentation process (50 kg/batch) (RRL, Jammu)	Designed and installed
7.	Ethylene dibromide (12 kg/day) (CSMCRI)*	1966
8.	Fine chemicals (NCL)	1964
9.	Hydrated calcium silicate (CSMCRI)*	1964
10.	Lead oxide electrodes for perchlorates (CECRI)	1964
11.	Manganese dioxide, electrolytic (25 kg/day) (CECRI)	Under erection
12.	Organic intermediates (NCL)	1967
13.	Phthalates and other plasticizers (NCL)	1966
14.	Phthalic anhydride—sponsored by NRDC (125 kg/day) (CFRI)	1965
15.	Phthalic anhydride purification plant—sponsored by NRDC (125 kg/day) (CFRI)	1966
16.	Silicon carbide (75 kg/day) (RRL, Hyderabad)	1966
17.	Synthetic cryolite (50 kg/day) (NML)	Under erection
18.	Synthesis of hydrocarbons by Fischer Tropsch method (5 litres/day) (CFRI)	1967
19.	Titanium tetrachloride—sponsored project (NCL)	1965
20.	Washery plant for salt (400 kg/8 hr) (CSMCRI)*	1964
<b>INSECTICIDES AND PESTICIDES</b>		
21.	Insecticidal formulations including durofume and minifume (500 kg/day) (CFTRI)	1959
22.	Lindane (16 kg/day) (CFTRI)	1964
<b>FERTILIZERS</b>		
23.	Coal fertilizer (1 to 2 tonnes/day) (CFRI)	1966
24.	Phosphate fertilizers (200 kg/day) (RRL, Hyderabad)	1964
25.	Potassium schoenite (1.5 tonnes/day) (CSMCRI)*	1964

(1)	(2)	(3)
<b>GLASS, REFRACTORIES AND CLAYS</b>		
26.	Bleaching earth plant (RRL, Hyderabad)	1960
27.	Optical glass (10 tons/year) (CGCRI)	1960
28.	Pyrometric cones (5 lakh cones/year) (RRL, Hyderabad)	1959
29.	Refractories plant (1 ton of raw material/day) (NML)	1960
30.	Special glass and refractory articles production unit (CGCRI)	1966
<b>PULP AND PAPER</b>		
31.	Dissolving pulp for rayon grade pulp (NCL)	1958
32.	Hand-made paper (0.5 ton/day) (RRL, Jorhat)	1968
33.	Hand-made and speciality paper (50 kg/day) (RRL, Hyderabad)	1953
<b>FOODS AND BEVERAGES</b>		
34.	Cottonseed flour including solvent extraction plant (RRL, Hyderabad)	1964
35.	Indian multipurpose food (500 kg/day) (CFTRI)	1957
36.	Integrated groundnut utilisation for protein isolate (250 kg seed/day) (CFTRI)	1960
37.	Instant tea (100 kg green leaves/batch) (CFTRI)	1963
38.	Lactone-vegetable toned milk (100 litres/day) (CFTRI)	1964
39.	Pectin (10 kg/day) (CFTRI)	1965
40.	Pectolytic enzyme (10 kg of bran/batch) (CFTRI)	1964
41.	Ready mixes (50 kg/batch) (CFTRI)	1964
42.	Tamarind juice concentrate (50 kg/day) (CFTRI)	1964
43.	White pepper and pepper-like oil from black pepper (1 tonne green pepper/day) (CFTRI)	1964
44.	Whole egg powder (50 kg/day) (CFTRI)	1966
<b>OILS AND ALLIED VEGETABLE PRODUCTS</b>		
45.	Aromatic absolute of Ambrette seed (200 kg seed/batch) (NBG)*	1966
46.	Cardamom oil (25 kg cardamom/batch) (CFTRI)	1964
47.	Castor oil hydrogenation plant (RRL, Hyderabad)	1959
48.	Cottonseed oil refining (1.8 tonnes/day) (RRL, Hyderabad)	1959
49.	Distillation of cashewnut shell liquid for cardanol (40 litres/batch) (RRI, Hyderabad)*	1964
50.	Fat splitting and fatty acid distillation (100 kg/batch) (RRL, Hyderabad)	1959
51.	Extraction, isolation and purification of total alkaloids from plant material (40 kg/batch) (RRL, Jammu)	Plant designed and installed 1959
52.	Oilseeds milling (20 tonnes/day) (RRL, Hyderabad)	

(1)	(2)	(3)
<b>LEATHER AND AUXILIARIES</b>		
53. Leather auxiliaries		
(a) Belting cement (90 kg/batch)		1958
(b) Enzyme bates (21.5 kg/batch)		1965
(c) Hide powder		1959
(d) Acrylic resin emulsion (75 kg/batch)		1963
(e) Lacquers and lacquer emulsions (60 kg./batch)		1964
(f) Top dress M. S. (50 kg/batch)		1966
(g) Alkyd resin (11 kg/batch)		1966
(h) Chrome stearate chloride—shower proofing agent (2.2 kg/batch)		1966
(i) Chrome liquor—16% Cr <sub>2</sub> O <sub>3</sub> (45 kg/batch) (CLRI)		1966
54. Shark skin leather—pilot plant trials at Reg. Ext. Centre, Rajkot (CLRI)*		1965
55. Sports goods leather (Reg. Ext. Centre, CLRI, Jullundur)		1965
56. Surgical sutures and sausage casings (CLRI)		1964
57. Syntans and fat liquors—NRDC plant (200 kg/batch) (CLRI)		1965
58. Tannin extract (50 kg/batch) (CLRI)		1964
<b>COAL AND CARBON PRODUCTS</b>		
<b>Coal processing</b>		
59. Briquette curing plant (½ tonne/hr) (CFRI)		1966
60. Briquette maturing plant (6 tonnes/day) (RRL, Hyderabad)		Plant installed
61. Briquette carbonisation plant (12 tonnes/day) (RRL, Hyderabad)		Plant installed
62. Composite coal washery (40 tonnes/hr) (CFRI)		1959
63. Cyclone washer plant (2.2.5 tonnes/hr) (CFRI)		1959
64. Fluidised carbonization semi-pilot plant (½ tonne/day) (CFRI)		1962
65. Fluidised low temperature carbonization plant (3 tons/day) (RRL, Jorhat)		1965
66. Froth floatation plant (100 kg/hr) (CFRI)		1960
67. High pressure briquetting plant (1.25 tonnes/hr) (CFRI)		1965
68. High temperature carbonisation plant (5 tonnes/day) (CFRI)		1957
69. Low temperature carbonisation of coal (25 tonnes/day) (RRL, Hyderabad)		1953
70. Low/Medium temperature carbonisation prototype plant (20 tonnes/day) (CFRI)		1961
71. Low pressure briquetting plant (1.5 tonnes/hr at 1 to 1.2 tons/sq. in. pressure) (CFRI)		1956
72. Moving bed devolatilisation plant (10 tonnes/day) (CFRI)		1957
<b>Gas Producing Units</b>		
73. High pressure coal gasification plant (800 kg/hr at 32 kg/cm <sup>2</sup> pressure) (CFRI)		1962

(1)	(2)	(3)
74. Hydrogen gas from synthesis gas (35 Nm <sup>3</sup> /hr at 350 lb./sq. in.) (CFRI)		1966
75. Methane gas generator (65 Nm <sup>3</sup> /day) (CFRI)		1966
76. Powdered coal gasification plant (100 kg/hr) (CFRI)		1959
77. Producer gas plant (510 Nm <sup>3</sup> /hr) (CFRI)		1961
78. Town gas from naphtha (500 Nm <sup>3</sup> /day) (IIP)		Plant erected
79. Water gas semi pilot-plant (40 Nm <sup>3</sup> /hr) (CFRI)		1958
<b>Tar Processing Units</b>		
80. Distillation of low temperature tar (3 tonnes/batch) (RRL, Hyderabad)		1959
81. Fractionation of tar acids (40 kg/batch) (RRL, Hyderabad)		1962
82. Hydrogenation of tar acids (5 litres/hr) (RRL, Hyderabad)		1962
83. Tar distillation plant (1 ton/batch) (CFRI)		1967
84. Tar hydrogenation plant (450 litres/day) (CFRI)		1967
85. Recovery of tar acids from ammonical liquor (200 litres/hr) (RRL, Hyderabad)		1961
86. Recovery of tar acids from tar oil (150 litres/hr) (RRL, Hyderabad)		1962
<b>Carbon Products</b>		
87. Active carbon (50 kg/day (CFRI)		1965
88. Activated carbon-grade I—NRDC (100 tonnes/year (RRL, Hyderabad)		1958
89. Activated carbon-grade II (200 kg/day) (RRL, Hyderabad)		1960
90. Activated carbon-Hykol X—NRDC (2 tonnes/day) (RRL, Hyderabad)		1964
91. Carbon project (NPL)		1957
92. Formed coke plant (2000 kg/day) (CFRI)		1967
<b>PETROLEUM AND PRODUCTS</b>		
93. Biosynthesis of protein from petroleum (1 ton/day) (RRL, Jorhat)		1968
94. Proteins from petroleum (IIP)		1967
95. Reclamation of used lubricating oil (200 litres/batch) (IIP)		1964
96. Reforming of iomex to be located at Barauni Refinery (1 tonne/day) Under designing (IIP)		Under designing
<b>METALS AND MINERALS</b>		
97. Anodic phosphating (CECRI)		Under erection
98. Chemical polishing of aluminium (NML)*		1960
99. Cupola (melting capacity 500 kg/hr) (CFRI)		1966

(1)	(2)	(3)
100. Ferro alloy plant (1 to 3 tons ore/day) (NML)*		1962
101. Hot dip aluminising of ferrous materials (1 ton/day) (NML)		1960
102. Integrated mineral beneficiation plant (5 tons ore/day) (NML)		1963
103. Low shaft furnace plant (15 tons/day) (NML)		1959
104. Magnesium and magnesium powder (NML)*		1961
105. Magnesium metal (250 tons/year) (NML)		Under erection
106. Magnesium metal sponsored by Madras Government (12 kg/day) (CECRI)*		1964
107. Magnesium metal (70 kg/day) (CECRI)		1967
108. Manganese metal and manganese dioxide from low grade manganese ore (45 kg/day) (NML)		1961
109. Permanent magnet plant (NML)		1963
110. Thermal beneficiation of low grade manganese and chrome ores (45 kg/day) (NML)*		1960
<b>BUILDINGS AND BUILDING MATERIAL</b>		
111. Brick manufacture by semi-mechanised process (10,000 bricks/day) (CBRI)		1966
112. Fluidised bed furnace (2 tonnes/day) (CBRI)		1965
113. Lime kiln (4 tonnes/day) (CBRI)		1967
114. Particle board and roofing materials from saw dust without binder (100 kg/day) (RRL, Jorhat)		1965
115. Reactive surkhi and lime reactive surkhi (CRRI)		1962
116. Sorel cement tiles (200 tiles/8 hr) (CSMCRI)*		1966
117. Vertical shaft kiln cement plant (30 tons/day) (RRL, Jorhat)		1967
<b>ROADS</b>		
118. Abrasive resistance of cement concrete pavement (CRRI)		1966
119. Flexible overlay test track (CRRI)		1965
120. Location of hidden deposits of Kankar by means of Air photo interpretation (CRRI)		1966
121. Prestressed concrete pavement lengths (CRRI)		1966
122. Stabilisation of black cotton soil with lime (CRRI)		1962
123. Stabilisation of berms of national highway in black cotton soil areas (CRRI)		1965
124. Stabilisation of sand with bentonite		1965
125. Stabilisation of soil with soft aggregates (CRRI)		1957
126. Use of scientifically compacted soil in place of stone or bricks in the lower layers of road pavements (CRRI)		1957

(1)	(2)	(3)
<b>PUBLIC HEALTH ENGINEERING AND WATER PURIFICATION</b>		
127. ABX biflow filter (CPHERI)		Under construction
128. Electrodialysis unit using ion exchange membrane (4,500 litres/8 hr) (CSMCRI)		1966
129. High rate mechanical composting plant (0.5 ton/day) (CPHERI)		1964
130. High rate sludge digester at Hyderabad (100,000 gal.) (CPHERI)		1966
131. Humidification, dehumidification unit-cum-solar energy collector for desalinating sea water (5,000 litres/day) (CSMCRI)		1966
132. Imhoff tank and solar still (7,500 gal./day (CPHERI)		1964
133. Night soil digesters (2) (210 cu. ft. each) (CPHERI)		1965
134. Oxidation ditch brush aeration (6,000 gal.) (CPHERI)		1966
135. Oxidation pond, Nagpur (CPHERI)		1965
136. Treatment of tannery effluent (CLRI)*		1964
<b>EQUIPMENT, INSTRUMENTS AND COMPONENTS</b>		
137. Aluminium capacitors (CECRI)		Under erection
138. Batch production of Geophysical instruments (NGRI)		1968
139. Electrical transducers and associated measuring equipment (NAL)		1965
140. Electronic components (NPL)		1963
141. T.V. receivers (1,000 sets/yr) and printed circuits (CEERI)		1966
142. Optical components (sponsored project) (CSIO)		1966
<b>OTHERS</b>		
143. Gas mask revivification (12 gas mask canisters/day) (CFTRI)		1960



TABLE 12—ANALYSIS, TESTING AND ENQUIRIES

(1967-68)

Sl. No.	Name of the Institute/ Laboratory	Analysis and testing		Enquiries		Demons- stration and extension work
		Number of samples	Fee charged	Number of enquiries	Technical and non- technical notes sent	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	NCL, Poona	135	4,853.00	800	26	4
2.	NPL, New Delhi	1,903	95,097.64	634	—	—
3.	CFRI, Dhanbad	14,326	1,59,271.57	541	124	6
4.	CGCRI, Calcutta	436	50,758.60	632	6	6
5.	CFTRI, Mysore	49	949.00	2,137	259	9
6.	NML, Jamshedpur	572	26,014.00	216	18	—
7.	CDRI, Lucknow	1,263	9,224.00	381	1	—
8.	CRRI, New Delhi	55	4,957.50	96	6	9
9.	CECRI, Karaikudi	2	108.47	325	154	6
10.	CLRI, Madras	228	6,408.35	1,045	37	174
11.	CBRI, Roorkee	86	4,362.00	673	30	—
12.	NBG, Lucknow	—	—	78	9	—
13.	CEERI, Pilani	—	—	205	4	—
14.	CSMCRI, Bhavnagar	34	930.00	1,120	1	2
15.	CMRS, Dhanbad	3,678	2,39,609.26	71	6	2
16.	RRL, Hyderabad	173	9,610.00	4,183	62	2
17.	RRL, Jammu	308	—	344	6	—
18.	CMERI, Durgapur	NA	1,00,811.69	637	—	—
19.	CIMPO, Lucknow	18	150.00	279	20	—
20.	CPHERI, Nagpur	998	12,885.67	120	14	10
21.	CSIO, Chandigarh	14	355.00	141	—	—
22.	NAL, Bangalore	45	10,785.41*	185	53	—
23.	IIP, Dehra Dun	87	50,025.05	401	62	—
24.	RRL, Jorhat	759	28,848.00	485	36	2
25.	SERC, Roorkee	NA	4,285.93*	29	5	—
26.	RRL, Bhubaneshwar	6	340.00	52	12	—
		25,175	8,20,640.14	15,810	951	232

\*Including computer facilities provided

**TABLE 13 - PATENTS FILED, ACCEPTED AND SEALED**

(1967-68)

S.1 No.	Name of the Laboratory	Number of Patents			Number of Patents		
		Filed	Accepted in India	Sealed	Filed	Accepted abroad	Sealed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	NCL, Poona	5	1	5	—	1	1
2.	NPL, New Delhi	7	6	3	—	—	—
3.	CFRI, Dhanbad	7	4	4	—	3	1
4.	CGCRI, Calcutta	4	1	2	—	—	—
5.	CFTRI, Mysore	3	—	—	—	—	—
6.	NML, Jamshedpur	3	3	2	1	1	—
7.	CDRI, Lucknow	6	1	—	—	—	—
8.	CRRI, New Delhi	4	1	1	—	—	—
9.	CECRI, Karaikudi	34	20	21	8	2	1
10.	CLRI, Madras	2	1	2	—	2	4
11.	CBRI, Roorkee	5	4	1	—	—	—
12.	CEERI, Pilani	4	2	1	—	—	—
13.	CSMCRI, Bhavnagar	7	1	—	—	—	—
14.	CMRS, Dhanbad	7	13	11	—	—	—
15.	RRL, Hyderabad	7	3	2	—	2	1
16.	RRL, Jammu	1	1	1	—	—	—
17.	CMERI, Durgapur	10	4	2	—	—	—
18.	NAL, Bangalore	4	1	1	—	—	—
19.	IIP, Dehra Dun	2	2	1	—	—	—
20.	RRL, Jorhat	13	2	1	3	—	—
21.	SERC, Roorkee	1	—	—	—	—	—
22.	RRL, Bhubaneshwar	3	—	—	—	—	—
23.	CDEO, New Delhi (PEC)	—	2	—	—	—	—
24.	BITM, Calcutta	—	1	—	—	—	—
25.	SCHEMES	7	5	7	—	2	1
		146	79	68	12	13	9

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98. British India Corporation, Cooper Allen Branch, Kanpur	...	...	...	87, 88
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144.	Commissioner of Police, Bangalore	...	81
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146.	Corn Products (India) Pvt. Ltd., Bombay	...	70
147.	Coromandel Chemicals, Madras-20	...	11, 17, 18, 19
148.	Coromandel Steel Ltd., Madras	...	90, 94
149.	Crystal Engineering Co., Rajkot	...	52
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203.	Ferro Electrics Pvt. Ltd., Hyderabad	...	...	...	24
204.	Fertilizers and Chemicals Travancore Ltd., Alwaye	...	...	...	46
205.	Fertilizer Corporation of India, Sindri	...	...	...	76
206.	Ford Foundation, U.S.A.	...	...	...	83
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208.	Fritz & Singh (P) Ltd., Calcutta-47	...	...	...	29
209.	G. E. (MES), Roorkee	...	...	...	55
210.	G. P. Tolani & Co., Bombay-6	...	...	...	41
211.	G. Vallabhdas & Co., Bombay-9	...	...	...	48
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215.	Gandhishah Chemidyes Industries, Ahmedabad	...	...	...	36, 37
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230.	Gold Filled Leather Works, Bombay-17	...	...	...	17, 87
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237. Gujarat Cement Ltd., Bombay-1	...	...	...	75
238. Gujarat Mineral Development Corporation Ltd., Baroda	...	...	...	72
239. Gujarat Oil Mills & Manufacturing Co. Ltd., Ahmedabad-16	...	...	...	7
240. Gujarat Pharmaceutical and Chemical Works, Ahmedabad-16	...	...	...	36, 48
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247. Harvin Optical Glass Industries, Hyderabad	...	...	...	50, 51, 52
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254. Hindustan Aluminium Corporation Ltd., Renukoot	...	...	...	72
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256. Hindustan Construction and Commercial Corporation, Calcutta-6	...	...	...	22
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261. Hindustan Intermediates, Ahmedabad-21	...	...	...	35
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268. Hindustan Scientific Works, Ambala Cantt	...	...	...	50, 51
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274.	Hindustan Zinc Ltd., Zawar Mines, P.O. Udaipur		...	93
275.	Hira Industries, Poona-2	...	...	12
276.	Hyderabad Allwyn Metal Works Ltd, Hyderabad		...	88
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283.	Ideal Tannery, Calcutta	...	...	56
284.	India Carbon Ltd., Calcutta	...	...	71
285.	Indian Aluminium Co., Calcutta	...	...	43
286.	Indian Copper Corporation Ltd., Calcutta	...	...	40
287.	Indian Copper Corporation Ltd., Ghatsila	...	...	72, 73
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290.	Indian Drugs and Pharmaceuticals Ltd., Hyderabad		...	50, 85
291.	Indian Dyestuffs Industries Ltd., Kalyan, Bombay		...	68, 95
292.	Indian Hides and Skins Improvement Society, Madras		...	71
293.	Indian Institute of Science, Bangalore	...	...	81
294.	Indian Institute of Technology, Kharagpur	...	...	77
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297.	Indian Organic Chemicals Ltd., Bombay	...	...	36
298.	Indian Oxygen Ltd., Calcutta-27	...	...	23
299.	Indian Plumbogo Co., Bombay	...	...	72
300.	Indian Refineries Ltd., H.O., New Delhi	...	...	79, 80
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320. J. G. Patel, Sambalpur	...	...	...	46
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322. J. K. Iron & Steel Co. Ltd., Kanpur	...	...	...	28
323. J. K. Minerals Ltd., Srinagar	...	...	...	69
324. J. K. Synthetics Ltd., Kanpur	...	...	...	85
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329. Jawan Industrial Enterprises, Ernakulam	...	...	...	10
330. Jayant Chemicals, Vartej	...	...	...	47
331. Jay Hind Industries Pvt. Ltd., Poona	...	...	...	92
332. Jayshree Chemicals Ltd., Chatrapur	...	...	...	53
333. Jayshree Fertilizers & Chemicals, Calcutta	...	...	...	46
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337. Joint Director of Mine Safety, Warangal Region, P.O. Hanamkonda	...	...	...	93
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345. Kandaswamy Nib Works, Sathur	...	...	...	50
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347. Kankanee Colliery Ltd., Pootkee Colliery, P.O. Kusunda, Dist. Dhandad	...	...	...	93
348. Kanoria Chemicals and Industries Ltd., Renukoot	...	...	...	96
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357.	Kopper Exports GMBH, Calcutta-13	...	...	...	44
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359.	Korvi Fullers Earth Processing Industry, Gulberga	...	...	...	17
360.	Krishna Industrial Corporation, Nidadavole	...	...	...	96
361.	Kumar Brothers, Secunderabad	...	...	...	70
362.	Kumardhubi Engineering Works Ltd., Kumardhubi	...	...	...	28, 28, 30, 44, 88
363.	Kumar Manufacturing Co., Howrah	...	...	...	17, 54
364.	Kutch Salt and Allied Industries, Kandla	...	...	...	88
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366.	Lalchand Mahadeolal, Howrah	...	...	...	20
367.	Lakshmi Chemicals, Calcutta-11	...	...	...	39
368.	Laxmi Stores, Bombay	...	...	...	12
369.	Lead Slips Products Pvt. Ltd., Ahmedabad	...	...	...	19
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371.	Leather India Tannery, Kalpakarichery	...	...	...	87
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373.	Lotus Industries, Madras-4	...	...	...	7
374.	M.E.T. Industries, Calcutta	...	...	...	88
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378.	M.P. Udyogik Vikas Nigam Ltd., Bhopal	...	...	...	73
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383.	Magneto Electric Control Pvt. Ltd., Calcutta	...	...	...	43
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385.	Maharaja Cossimbazar Chinaclay Mines Pvt. Ltd., Calcutta	...	...	...	39
386.	Maharashtra Industrial Development Corporation, Poona	...	...	...	89
387.	Maheswary Graphite Udyog, Vijayawada-7	...	...	...	16
388.	Manchester Chemical Corporation, Bombay	...	...	...	11
389.	Mangalore Harbour Project, Mangalore	...	...	...	79
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396.	McKenzie Philip (India) Ltd., Delhi-7	...	41
397.	McNally Bird Engineering Co., Calcutta	...	29
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400.	Meters and Instruments Pvt. Ltd., Chandigarh	...	43
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405.	Minerals and Industrial Corporation, Madras-1	...	25
406.	Mine Safety Appliances Ltd., Calcutta-20	...	27
407.	Mining and Allied Machinery Corporation Ltd., Durgapur	...	45
408.	Ministry of Defence, Govt. of India, New Delhi	...	81
409.	Ministry of Health, F.P. and Urban Development, Govt. of India, New Delhi	...	79, 82
410.	Ministry of Petroleum and Chemicals, Govt. of India, New Delhi	...	74, 79, 80
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412.	Ministry of Transport (Road Wing) & Special Roads Directorate, P.W.D., West Bengal, Calcutta	...	74
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415.	Mohan Meakin Breweries Ltd., Mohan Nagar, Ghaziabad	...	13
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417.	Morris Electronics (P) Ltd., Poona-18	...	24
418.	Muhana Company, Shegaon	...	6
419.	Municipal Corporation, Delhi	...	74, 75, 76, 86, 89, 93, 94
420.	Municipal Corporation, Hyderabad	...	75
421.	Municipal Corporation, Nagpur	...	95
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426.	Narendra Silk Mills, Bombay-2	...	49, 50
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434.	National Institute of Health, U.S.A. ...	...	82, 83
435.	National Mineral Development Corporation, Faridabad	...	73, 96
436.	National Newsprint and Paper Mills Ltd., Nepanagar	...	76
437.	National Research Development Corporation of India, New Delhi		71
438.	National Tobacco By-products, Saharanpur	...	8
439.	Natson Manufacturing Co. Ltd., Bombay	...	37
440.	Natural Salt Industries, Belgaum	...	46
441.	Navsari Processing Industries Pvt. Ltd., Maroli	...	22
442.	Neofabrico, Calcutta-14	...	29
443.	Neveli Salem Steel Project, Madras	...	73
444.	Newkem Products Corporation, Bombay	...	46, 69
445.	Newmac Industries, Ahmedabad-1	...	13
446.	New Standard Engineering Co. Ltd., Bombay-13	...	73
447.	New Victoria Cotton Mills, Kanpur	...	89
448.	Nizam Sugar Factory, Nizamabad	...	96
449.	Non-edible Oil and Soap Industry, Khadi and Village Industries Commission, Bombay	...	70
450.	Officer Commanding Laboratory, Ministry of Defence, Govt. of India	...	86
451.	Oil and Natural Gas Commission, Dehra Dun	...	74, 78, 79, 80
452.	Omega Electronics, Jaipur	...	27
453.	Orgaroma India Pvt. Ltd., Hyderabad-12	...	6, 35
454.	Oriental Science Apparatus Workshop, Ambala Cantt	...	27, 28, 41, 42, 50, 51, 52, 76
455.	Orient Paper Mills, Amlai	...	76, 95
456.	Orient Paper Mills, Brajrajnagar	...	69, 76
457.	Orient Wire Industries Pvt. Ltd., Calcutta-7	...	20
458.	Orissa Mining Corporation, Dungri	...	72
459.	Orissa Wire Product Ltd., Cuttack	...	21
460.	Oxford Optical and Scientific Works, Delhi	...	50, 51
461.	P. Chengal Reddy, Hyderabad	...	68
462.	P. K. Bagla & Co., Calcutta	...	88
463.	P. Kishore & Co., Calcutta	...	52
464.	Panjab Agricultural University, Ludhiana	...	90, 94
465.	Panjab University, Chandigarh	...	76, 89, 94
466.	Paramount Iron and Steel Works Pvt. Ltd., Sonepat	...	22
467.	Parasea Colliery, P.O. Kajoragram, Dist. Burdwan	...	71
468.	Parco, New Delhi-1	...	53
469.	Patel Amin & Co., Odhav	...	15

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471.	Paul Babula & Co., New Delhi	...	...	25
472.	Peanut Products Pvt. Ltd., Madras	...	...	54
473.	Peoples Tannery, Calcutta	...	...	55
474.	Perambur Chrome Tannery, Perambur	...	...	87
475.	Pesticide Limited, Bombay-28	...	...	7
476.	Pharma Products Pvt. Ltd., Tanjavur	...	...	68
477.	Philips Carbon, Calcutta	...	...	78
478.	Phosphate Company Ltd., Calcutta	...	...	46
479.	Photo Electric Instruments, Jaipur	...	...	81
480.	Piezoelectric Ceramics (India), New Delhi-14	...	...	41
481.	Pigment & Chemicals (India) Pvt. Ltd., Calcutta-1	...	...	10
482.	Pioneer Equipment Co. (P) Ltd., Calcutta-1	...	...	13, 36, 44
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